Waves of Change
Mechanisation and Socio-Economic Transformation in Kerala's Marine Fishing Industry



(Kerala Fishing Industry Research Series)

Vol. 1

Prof. (Dr.) Biju Terrence and Fr. Sanu F

WAVES OF CHANGE

Mechanisation and Socio-Economic Transformation in Kerala's Marine Fishing Industry

(1950s - 2005)

Volume 1

Kerala Fishing Industry Research Series

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Waves of Change: Mechanisation and Socio-Economic Transformation in Kerala's Marine Fishing Industry

(*Kerala Fishing Industry Research Series*)

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FOREWORD

This book inaugurates the Kerala Fishing Industry Research Series, a comprehensive five-volume examination of one of the most significant economic transformations in modern Kerala. What began in 1953 with the Indo-Norwegian Project at Neendakara-Sakthikulangara fundamentally reshaped not only Kerala's fishing sector but the entire socio-economic fabric of its coastal communities. This series seeks to document, analyze, and understand this transformation in all its complexity.

The mechanisation of Kerala's fishing industry represents a paradigmatic case of technology-driven development in traditional sectors. The introduction of modern trawlers, synthetic nets, and sophisticated catching techniques dramatically increased fish production and exports, generating unprecedented economic opportunities. Yet this transformation also brought profound social disruptions, altered gender dynamics, environmental challenges, and complex questions about equity and sustainability that continue to resonate today.

Understanding this transformation requires moving beyond simplistic narratives of either unqualified progress or technological determinism. The reality is far more nuanced—mechanisation created winners and losers, opened opportunities while foreclosing others, enhanced livelihoods for some while marginalizing others. This series adopts a multi-dimensional, empirically grounded approach to capture this complexity across five interconnected volumes.

Volume 1 (this volume) establishes the empirical and analytical foundation. Based on extensive primary research involving 450 fish workers and 150 vessel owners across Kerala's southern, central, and northern coastal regions, it examines the mechanisation process itself and its impacts on workers and vessel owners. The analysis spans three

distinct fishing sectors—traditional non-motorised, traditional motorised, and mechanised—providing comparative insights into how different segments experienced technological change. This volume employs rigorous statistical analysis of 88 data tables covering demographic conditions, income patterns, investment returns, social life indices, and stakeholder perspectives from the 1950s through the early 2000s.

The series architecture spans five interconnected volumes: Volume 2 will extend the analysis to the post-harvest economy; Volume 3 foregrounds women's economic roles; Volume 4 applies behavioral economics frameworks to understand decision-making under uncertainty; Volume 5 addresses the critical contemporary challenges facing Kerala's fishing sector including climate change impacts, resource sustainability, and pathways toward a resilient blue economy.

Kerala's fishing industry transformation holds significance far beyond the state's borders. It offers crucial insights for coastal development policy across South Asia and the Global South. The challenges Kerala faces—balancing economic development with social equity, managing common-pool resources sustainably, addressing gender inequities, adapting to climate change—are challenges confronting fishing communities worldwide.

This series contributes to multiple academic disciplines—development economics, fisheries management, technology studies, gender studies, behavioral economics, and environmental science—while maintaining accessibility for policymakers, industry practitioners, and community organizations. Each volume in this series is designed to stand alone while contributing to the comprehensive whole. Together, these five volumes aspire to become the definitive scholarly treatment of Kerala's fishing industry transformation—a reference work that shapes both understanding and policy for decades to come.

CHAPTER I

INTRODUCTION

"There is no other region in India which is as rich as Kerala in fish resources and no other state possesses fishworkers as intelligent and work conscious as those in Kerala".[1]

Kerala is one of the leading maritime states in India. The marine resources of Kerala are obtained from a coastline of 560km, spread over an area of 38,100 sq.km.[2] This area forms only seven percentage of the continental shelf of India. The Kerala coast, popularly known as Malabar coast from very early times, provides one of the richest fishing zones in the world.

The fisheries sector is not only a unique source of cheap animal protein to the population but also generates employment and income for the rural poor and valuable foreign exchange for the country. The fishing industry makes valuable contributions both to our domestic food supply and exports. The marine potential of Kerala is enormous and only a small part of it is currently being exploited.

Although the coastline is only about one-tenth of the whole coastline of India, the landings and exports in Kerala constitute more than one-fourth of the country's fish production.

A lot of changes have taken place in the fisheries sector of Kerala. Primarily those which happened in the catching strategy, of which the most important one is the mechanisation process. As a result, the marine fisheries sector of Kerala was divided into two sectors, namely, traditional and modern. The modern sector or mechanised sector was introduced in 1953 at Neendakara, Sakthikulangara region of Kollam district under the initiative of Indo-Norwegian Project (INP). The novel things introduced in fishing industry by INP are mechanically operated new boats, new nets, ice-factories, cold storages, new forms of distribution and new methods of fish processing. The successful trawl carried out at the fishing village of Kannamali in Eranakulam during 1979-80 attracted the fishermen community. Soon motorization

programme gained momentum in Kerala and fishermen of Alleppey, Ernakulam and Kollam districts were credited for the initiative and large scale adoption. Later in the 1980s we witnessed the quick and large scale motorization of country crafts used in the traditional sector. As a result of this, the traditional sector can again be divided into two sectors: traditional non-motorised sector and traditional motorised sector. Now the traditional fishermen operate with big country crafts (valloms) fitted with inboard diesel engines. Three different sectors in marine fishing sector are identified in the present study, viz.,

- Traditional Non-motorised sector (TNM)
- Traditional Motorised sector (TM) and
- Mechanised sector (M)

1.1 Research Problem

Fishing, one of the oldest industries of the world dates back to the Mesolitic period to trace its origin. It even precedes agriculture. The industry has had its mark and influence on the Indian civilisation and culture even in ancient times. Today fishes are renowned source of domestic food supply and important international items of export. Kerala today holds a leading position in India as exporter of fish and fisheries products.

The most important change in the fishing sector is the mechanisation of fishing vessels. This process has brought about many changes in the socio-economic conditions of the fishermen. These changes in the lives of fishermen and vessel owners with respect to their social life, income, savings, liability, acquisition of land and other facilities resulting from mechanisation has not been studied comprehensively. Though the government has set parameters to measure the socio-economic status of fisherfolk as in the case of other agricultural communities, no attempt has been made to assess the changes brought forth by mechanisation.

Hence the key attempt here is to assess the changes that are experienced both by the owners and the workers as a result of mechanisation.

The emphasis in this regard is to study the problems, notably - how much has mechanisation affected the earnings of workers and owners?, impact of mechanisation on their income, liabilities, savings and in general to evaluate the changes in their social life index. The return on investment received by owners of fishing vessels is also a subject of the study. The other related problems include the question whether mechanisation has led to a shift in the fishing sector; problems and prospects of the industry in the post mechanisation period; opinions and views regarding trawling ban as expressed by the workers and vessel owners of different fishing sectors and regions. In short the study centres on the mechanisation process of the fishing industry and its impact on workers and vessel owners.

1.2 Objectives of the Study

The broad objective of the study is to analyse the impact of mechanisation process on fishing industry in Kerala. The following are the specific objectives:

1. To analyse the process of mechanisation of fishing industry in Kerala.
2. To study the impact of mechanisation of fishing industry on fish workers.
3. To study the impact of mechanisation on owners of vessels.
4. To analyse the rate of return of vessel owners of the fishing industry, and
5. To study the problems and prospects of mechanised fishing industry.

1.3 Hypotheses of the Study

The following hypotheses have been formulated on the basis of the objectives of the study:

The shift of workers from one sector to another resulted in change in their social life index.

The mechanisation process led to a marked improvement in the income level of workers during the catchment season.

The mechanisation process led to a marked improvement in the social life index of fishing vessel owners.

There is no significant difference between savings of vessel owners of different fishing sectors and fishing regions.

Workers of different fishing sectors do not differ significantly on the prospects of fishing industry on account of mechanisation.

Owners of fishing vessels of different fishing sectors do not differ significantly on the reasons for absence of a steady growth in production and export of marine products from Kerala in the post mechanised period.

1.4 Data Base and Methodology

The present study is an empirical one based on survey method. The research design and methodology adopted for the study is given below.

1.4.1 Sampling Design

This is a sample study. A multi stage random sampling technique was used to select the sample.

1.4.2 Selection of the Sample Region

The fishworkers and owners of fishing vessels from all the 14 districts of Kerala form the universe of the study. But among the 14 districts, Pathanamthitta, Kottayam, Idukki, Palakkad and Wayanad do not have

marine fishing operation. Therefore, the actual populations of marine fish workers and owners in Kerala spread only over the nine coastal districts in Kerala. The nine marine districts are Thiruvananthapuram, Kollam, Alappuzha, Eranakulam, Thrissur, Malappuram, Kozhikode, Kannur and Kasaragode.

With regard to the marine fishermen population, the districts Thiruvananthapuram, Alappuzha, Kozhikkode, Kollam, Malappuram and Eranakulam are the leading centres followed by Thrissur, Kannur and Kasaragode. The fishermen population, for better results is first divided into two : workers and owners of vessels. As there is no clear division by government, here an attempt is made to segregate them with respect to the fishing crafts in operation as per the statistics published by the department of fisheries. Based on nature of operation and type of operation both owners of vessels and workers from marine sector are further divided into three sectors namely,

- Traditional non-motorised sector
- Traditional motorised sector and
- Mechanised sector.

When we look into the number of crafts in operation the leading fishing centres in marine sector are identified as three regions. They are

The southern region, comprising of Kollam, Thiruvananthapuram and Alappuzha districts. The central region consisting of Eranakulam and Thrissur districts, and the northern region covering Malappuram, Kozhikode, Kannur and Kasaragode districts.

1.4.3 Selection of Sample

From among the three regions a total of 450 fish workers and 150 fishing vessel owners were selected on random base. After collection of data from the selected sample i.e., 450 workers – 150 from each region and 150 vessel owners-50 from each region; it was found that certain

interview schedule were incomplete and not conclusive for further analysis, hence they are excluded, and the total sample was finally limited to 402 workers and 129 vessel owners from three different fishing sectors and regions.

The sector wise and region wise distribution of the sample of fish workers and vessel owners is presented below.

Table 1.1 Distribution of Sample According to Sector and Region

Region	Fishing Sector TNM		Fishing Sector TM		Fishing Sector M		Total	
	No. of Workers	No. of Owners	No. of Workers	No. of Owners	No. of Workers	No. of Owners	No. of Workers	No. of Owners
Southern	5	9	23	10	110	25	138	44
Central	7	6	35	15	84	20	126	41
Northern	9	3	37	15	92	26	138	44
Total	21	18	95	40	286	71	402	129

1.4.4 Collection of Data

The study made use of primary and secondary data.

Primary Data

The study is mainly based on primary data. It was collected mainly from two different groups, fish workers and fishing vessel owners. Two different interview schedules were developed for collecting data from them. A pilot survey was initially carried out in the southern region by selecting 40 workers – 20 from mechanised and 10 each from motorised and non-motorised sectors, and 20 owners-10 from mechanised and 5 each from motorised and Non-motorised sectors. Necessary changes and modifications were effected in the interview schedules on the light of the pilot survey. The primary data collection took a period of one year from April 2004 to March 2005. In addition to this, for gaining more

information regarding the marine fishing sector, discussions were made with MPEDA executives, fisheries department officials, fish exporting company executives, trade union leaders and other experts related to the industry.

Secondary Data

Besides primary data, secondary data were also used. The secondary data were collected from various publications of State Planning Board, Department of Fisheries, Marine Products Export Development Authority, Central Marine Fisheries Research Institute, Centre for Developmental Studies, South Indian Federation of Fishermen Societies, Matsyafed, Programme for Community Organisation etc. Books, newspaper reports, articles, working papers, published and unpublished research dissertations etc. were also used.

1.4.5 Variables Selected for the Study

The variables selected to measure the impact of mechanisation on fish workers include:

- Socio-demographic conditions of workers
- Activities of womenfolk among fishers
- Ancestral occupation or traditionality of fishing operation.
- Social life index of fish workers
- Income of workers during catchment season
- Income of workers during off season
- Savings of workers, and
- Liabilities of workers.

In addition to the above given variables the operating cost of the vessels and return on investment of vessel owners were added to measure the impact of mechanisation on vessel owners.

Moreover, the workers and owners are grouped in accordance with their shift in fishing sector to evaluate the impact. Opinions and views of owners and workers belonging to different fishing sector were considered to measure the problems and prospects of the post mechanised fishing industry. Beside this, secondary data on the production and export of the industry in Kerala is also made use of in this study.

1.5 Tools of Analysis

The primary data collected were edited, classified, tabulated and analysed with the help of computer by using SPSS keeping in view the objectives of the study. The mathematical tools applied are averages, ratios and percentages. The statistical tools include chi-square test, analysis of variance, scheffe multiple comparisons, rank correlation, kruskal wallis test, t-test, Z-test and mann-whitney u test.

1.6 Scope of the Study

The present study is an attempt to determine the impact of mechanisation of fishing industry on fish workers and fishing vessel owners. In addition to this an attempt is made to analyse the problems and prospects of mechanised fishing industry. The study focused mainly on the impact of mechanisation and it tries to analyse the returns of fishing vessel owners also. The marine fishing industry is nowadays facing a lot of problems like the Tsunami, 'Algaeblooming', invasion of 'Kadal makri', marketing problems, effect of sand mining, lack of quality as prescribed by foreign countries, infrastructure facilities needed etc. and these issues do not come under the purview of the present study. The focus of the study is on the mechanised fishing sector of the industry.

1.7 Limitations of the Study

The present study suffers from the following limitations.

Most of the respondents were reluctant to supply information regarding income and savings, as a result, difficulties were experienced for collecting the primary data. Hence the supplied data regarding income etc. were cross examined with the opinions of Tharakans (Middle men), other allied workers and through observation. The reliability of data depends to an extent on the information supplied by them.

The lack of awareness of certain respondents regarding the academic research made some of them hostile in giving out information. In addition to this the 'Tsunami' which hit the Kerala coast during the period also angered the fishermen community, because of the unfulfilled promises made by the government and other agencies. This demanded repeated visits to the sampling units for three to four times. Moreover some of them need to be replaced or avoided due to lack of correctness and clarity of responses.

However a systematic and sincere effort is made to collect and present data in a scientific and logic manner, keeping in view the objectives of the study.

1.8 Scheme of Reporting

The study is presented in 8 chapters. Chapter one deals with introduction. Chapter two narrates the review of related literature. Overview of the fishing industry is given in chapter three. The mechanisation process of fishing industry in Kerala is dealt with chapter four. Chapter five analyses the impact of mechanisation of fishing industry on fish workers. The sixth chapter analyses the impact of mechanisation of fishing industry on fishing vessel owners. Chapter seven analyses the problems and prospects of mechanised fishing industry, and the final chapter eight, summarises the findings and suggests certain recommendations for the improvement of the industry.

References

[1] John Kurien, Fisheries Co-operative in Kerala – A critic, (Bay of Bengal Programme 1980), P.6.

[2] Government of Kerala, Economic Review 2005, Thiruvananthapuram: State Planning Board, February 2006, p.118.

CHAPTER II

REVIEW OF LITERATURE

Fisheries sector and fisher folk in Kerala have drawn attention of many, especially the academic community. Nowadays, several voluntary organizations like Programme for Community Organisations (PCO) and, South Indian Federation of Fishermen Societies (SIFFS) are deeply interested in the studies of fisheries sector, especially the traditional sector. There are several studies that emphasize on traditional fisheries sector, its technological changes, traditional fishermen's socio-economic conditions and the like. But there are only a few organized studies on the mechanised sector of fishing. This chapter is an attempt to review the available literature related to fishing industry so that an idea about the present position of fishing industry will be known. A sincere effort is made to present the earlier studies related to fishing industry in general and mechanisation in particular, chronologically.

Per Sandevan (1959)[1] studied the working of the Indo-Norwegian Project (INP) at Neendakara. It is considered to be the first study about the INP project implemented in Sakthikulangara-Neendakara region. Thankappan Achary and Devadasa Menon (1963)[2] carried out a specific enquiry into the impact of mechanisation of fishing in Neendakkara. They observed that the introduction of mechanisation in the field of fishing had perceptibly improved levels of living of fishermen of the area in terms of housing, education and income.

Arne Martin Klausen (1968)[3] studied the inter community comparison between the Araya and Latin Catholic community in the Indo-Norwerigian Project region and found that the Latin Catholic community responded impressively to the Indo-Norwegian Project (INP) activities.

Thankappan Achary (1969)[4] brought out a report regarding the impact of Indo-Norwegian Project on the growth and development of Indian fisheries as a follow up of his reports about the findings of an economic assessment of fishing by small mechanised boats and canoes in the INP

area at Neendakkara and the general improvement in the economy of the fisher folk of INP area of Neendakkara and Sakthikulangara.

Government of India (1971)[5] carried out a study through its Programme Evaluation Division (PED) of Planning Commission. It was conducted on the basis of a survey related to three fishing villages in Kerala. The PED came to the conclusion that mechanised fishing resulted in tangible benefits. It helped to raise both the value of output per boat and income per worker when compared to traditional sector. It also found that the introduction of mechanised fishing had not increased the overall efficiency of fishing enterprises judged in terms of department of operation of fishing boats, fishing time, cost and returns to investment.

T.K. Kannappan (1975)[6] made a study on the working and living conditions of women engaged in the peeling sheds. He analysed the system of wage, mode of wage payment, sanitary conditions in the peeling sheds, opinion of family members towards women going for work in peeling sheds, grievances, grievance redressal procedures etc. The methodology adopted was explorative and descriptive in nature. The study observed that the sanitary conditions in the peeling sheds were not satisfactory. Frequent changes of employment - i.e., changing factories occurs due to non-payment of TA, ill-treatment of supervisors etc. The opinion of family members are changing positively about women going for work in the peeling sheds.

P.G.R Mathur (1977)[7] studied the positive effects of mechanisation process and his study was conducted in the Tanur fishing village of Northern Kerala. He pointed certain structural and organizational changes which took place in the fishing sector due to mechanisation. He also claimed that a section of new entrants, i.e. individuals outside the fishing sector entered the scene.

John Kurien's (1978)[8] studies on the impact of technological changes in the fisheries sector made an analysis of fisheries development in the

state in relation to the trends in production and distribution of fish output during the post mechanisation period from 1973 to 1976. The major findings were that the output growth was distributed in favour of mechanised sector and further marginalized the traditional sector fishermen.

Annie Felice (1980)[9] made a study to provide a better understanding of the economic, social and cultural variables that act as causal or resultant factors of the adoption of modern technological innovations in fishing. The general objectives of the study were, identifying the cluster of factors which result in the adoption of modern technology in fishing and understanding the impact of modernisation by identifying the cluster of resultant variables or consequences of innovative-adoption techniques in the fishing community selected for the study. The study made an attempt to establish a cause-effect relation between a set of personal, economic and social variables with the adoption behaviour of a group of small fishermen who lived in the Vypeen Island. It was also found that with respect to the variables like assets, education level, mass media, urban contact, aspiration and economic status, higher means were associated with adopter and non-adopters. With respect to age and fatalism negative critical ratio was obtained. With respect to the mode of utilizing mechanised crafts given by government to fishermen 92 percent of adopters and 100 percent of non-adopters had lost them due to difficulty in meeting initial expenses, heavy operational cost, poor quality of boats supplied and exploitation by middlemen. And it was concluded that mechanised boats are more productive. The adopter had more income, standard of living, housing conditions, health conditions and educational status. Their liabilities were also high.

Abdul Hakkim (1980)[10] made a case study of a few fishing co-operatives in Kollam district. The study was concentrated in Kollam, because Kollam accounted as a major center of mechanised fishing in Kerala. The major finding of the study was that the lion's share of

benefits of mechanised fishing in the state was garnered by persons or groups not actually engaged in the fish production sector such as officials, traders and industrialists.

P. Ibrahim (1986)[11] aimed at tracing the course of mechanisation in fishing sector of Kerala inorder to examine its impact on growth of output, employment, income and consumption. He also studied the changes brought about in the organization and structure of the fishing economy with particular reference to distributional justice. The study was based on secondary data collected from different sources. The study concluded with the findings that even before the introduction of mechanisation the fishing sector of Kerala had begun to acquire features of capitalist relations of production, which the mechanisation process imputed further. The mechanisation process even planned for increasing the income and employment levels of traditional fishermen but not fulfilled. It was noted that the fish production during the post mechanisation phase did not show any significant increase and it was claimed that the rise may be due to price rise, quantity changes and species mix changes accounting only for 2% each. He was of the view that employment opportunities, per-capita income of fishermen etc. were also on the downward move and economic conflicts had begun to emerge in fishing sector.

John Kurien and T.R.Thankappan Achari (1988)[12] tried to analyse the fisheries development policies in Kerala over years. They classified it into 3 stages- the first phase being slow modernisation phase (from 1956 to 1966) and second one being the rapid modernisation phase (1967 to 1980) and they called the period after 1980 as 'dilemma phase'. They found that during the slow modernisation phase total fish production was increased, share of pelagic species also increased, but in the case of demersal species only a marginal increase was found and they also pointed that the mechanised sector as a whole accounted for only about 4% to 5% of fish production. Favourable natural conditions and

appropriate technological changes contributed to a measurable increase in productivity of active fishermen. It has resulted in increase of their per capita income also. While going through the rapid modernisation phase in the early years it showed a marked increase in fish production and the major share was contributed by demersal species especially prawns. It automatically increased the productivity of labourers but it resulted in the entry of persons not traditionally involved in it and thus emerged a new owner class. But in the later years the fish production went into decline. This period widened the divergence in labour productivity between the mechanised and non-mechanised sectors. This divergence led to more aggression among fishermen during dilemma phase. They also pointed out the need for involving fish workers in management policy making. The government should take steps to ensure their participation in the policy formation and implementation.

Quilon Social Service Society (QSSS) (1989)[13] conducted a study in the Kollam coast on the socio-economic, educational and health status of fisher folk residing in the coastal belt of Kollam district. The study revealed that even after the technological innovations in the fishing sector, the fisher folk in Kollam district are very poor with regard to their housing, sanitation, health and education of children.

Government of Kerala (1990)[14], Department of Fisheries conducted a survey titled 'Techno, Socio-Economic Survey of Fisher folk in Kerala'. The study revealed the extent of under employment and un-employment among fishermen. The survey pointed out the problems of low productivity connected with escalation of operational cost and the diminishing returns.

Fredi Julian (1992)[15] attempted to examine the critical areas of seafood industry in Kerala. Emphasis was given to review the export performance of Indian sea food over the years and to assess the financial requirements of sea-food industry. Case study method was adopted and

it was found that the sea-food industry is relevant in the peculiar set up of our economy and how it faced acute competition in the world market. He also suggested to diversify the operation of organizations coming under seafood export industry.

Thampi Mathew (1993)[16] conducted his investigation into the living and working conditions of traditional fishermen in the municipal wards of Kollam town. The survey was initiated by the Kollam Municipal Council. The findings of the study were almost similar to that of the study conducted by QSSS in 1989.

J. Albaris (1994)[17] made a study on the history of Kerala Latin Catholic fishermen, with emphasis on change in social status made by Christian Missionaries. The major concern of the study was the social life of the fishermen community and influence of church and its machinery in promoting them. He concluded that the activities of Christian Missionaries touched the social, economic, religious and cultural life of fishermen in Travancore and the role of Church was very important in the day to day activities of fishermen. He also pointed that INP turns to be beneficial to the middle class and it resulted in conflict between different sectors.

Mukul (1994)[18] in his article published in Economic and Political Weekly described the conflict between traditional fisherfolk and the mechanised trawler boat owners over fishing rights that have been intensified in several parts of TamilNadu and Kerala. He described the conflicts between traditional and mechanised fishermen in Anjengo and Mampally in Trivandrum as well as Sakthikulangara, Kavanad, Neendakkara, Aravila and Kureepuzha of Kollam District. It also described the failure of government machinery to restrict conflicts.

T.R.Thankappan Achari (1994),[19] through his paper presented in the International Congress on Kerala Studies made a critical assessment of shrimp trawling of Kerala coast. The paper narrated the development of

shrimp trawling under state and private sectors, resource exploitation, pressure of fishing and the impact of trawling operation. It suggested strict management measures to regulate the number and size of crafts and gear. He stated that only proper regulations can preserve the industry.

J.B.Rajan (1994)[20] through his paper presented a strategy for the development of Kerala fisheries sector. He explained the need for such a strategy in the present changing environment. For evolving such a strategy a proper assessment of the sector, its external environment, the future and the stake holder's expectations etc. were analysed. SWOT analysis and establishment of overall objectives were also used for evolving a new strategy. He affirmed that the section contains the resources, physical environment, fishermen and the community at large, merchants, money-lenders, trade unions, concerned government departments, social and religious institutions and the consumers. The conflicting objectives of each of these groups demand the need for an indepth appraisal of the present status of Kerala. Based on the above analysis he concluded that prioritizing of objectives is needed. A strategy for meeting the objectives is to be developed so as to make use of the strengths and overcome the weaknesses.

Thomas Sebastian (1994)[21] in his paper tried to highlight some of the major problems facing the fisheries sector and some of the results of government policy initiatives, especially through co-operative societies and the dilemmas in the policy options of this sector. The paper provided a brief report on the status of fisheries sector in Kerala, with reference to output, employment, export, marketing research and government policies. The study realized that the failure in the past were not solely due to the wrong policies but mostly owing to the way they were implemented. So it is suggested that along with new or modified policies, there should be a commitment in the implementation of them for a better and expected result.

K.M.Shajahan (1994)[22] in his paper pointed out that the New Economic Policies (NEP) of the Government of India being implemented under the aegis of World Bank-IMF have an adverse effect upon the fisheries sector of Kerala. He argued that the NEP are going to worsen the crisis in the fisheries sector. The points he has listed in support are the ecological degradation and resource depletion, marginalisation of traditional fishermen and the increase in domestic fish price which affect the domestic consumers' welfare. He also argued that the introduction of NEP would mark the beginning of a new phase in the development of fishermen movements in the state.

Jona Halfdanardottir (1994)[23] in his paper discussed the emergence of social organizations and increasing politicization of the marine fisherfolk and the role played by catholic priests in these processes. The influence of catholic priests among fisherfolk, organization of Kerala Swathanthra Matsya Thozhilali Federation, Emergence of fishermen Co-operatives etc.were also discussed in the paper.

John Fernandez (1994)[24] has recorded the marine bio-diversity of Kerala due to Kerala's unique geographic and oceanographic features. He discusses the fishery resource potential of Kerala and its diversified nature, its depletion due to intervention of new technology, impact of mechanisation and intervention from other sectors like construction of big dams, bunds, reclamation of water bodies, deforestation, large scale application of pesticides and chemicals in agriculture and industrial wastes that pollute rivers and backwaters and thereby the sea. Coastal tourism is pointed as another threat to fish and fish workers.

G. Sugeetha (1994)[25] explained the formation of department of fisheries in 1914 as part of the Department of Agriculture. The department was concerned with problems related to increasing the yield, improve the marketing facility and to develop the marine industries. The programmes initiated by Travancore Government for promotion of

fisherfolk's socio-economic conditions such as starting special schools, provision of improved boats, organization of co-operative societies, sanctioning of poramboke etc. The paper concluded that the organization of department of fisheries help to promote the social status of fisherfolk of Travancore.

K.M. Udayabhanu (1994)[26] through his paper gave an account of the process of modernisation among the Dheevaras, a traditional fishing community of Kerala. The changes that occurred among Dheevara Community from the traditional social evils like 'untouchability' to modernisation of the society as a whole is detailed in his work. He concludes that the Dheevaras remained backward in education, they failed to inculcate intimate relationship with the educated sections of the high castes. Moreover the advent of mechanised fishing has created difficulties for them.

John Kurien (1995) [27] in his article published in Economic and Political Weekly, elaborates on the impact of joint ventures operating in Indian sea as part of the post-1992-IMF-World Bank monitored liberal economic policies of the government. He lists the consequences as more conflict in coastal Kerala, resource ruin, less fish for local consumption, exploitation of workers and stifling of national industry initiative.

Staff reporter, Malayala Manorama (1995)[28] reported the lack of fish catches for the fishermen in coastal Kerala. The report continued that the major reason for this kind of a panic condition is the invasion of trawlers. Even the mechanised boats were not getting any fishes now. The fishing operations like 'recruitment overfishing' causes destruction of certain species. It pointed out that another reason for resource depletion may be the absence of 'hytoplanktons' i.e. food plants for fishes. The processes now evident like 'upwelling' also resulted in resource depletion according to experts.

Ambrose Pinto, Berin Leekas and Latha Radhakrishnan (1995)[29] analysed the impact of deep sea fishing policy of Government. They cited that till the early 70's fishing was confined to traditional type of vessels like catamarans, country-crafts and canoes. The introduction of mechanised boats brought forth a number of socio-economic problems. The situation of traditional crafts is worse today on account of non-availability of fish. Inspite of the well known effects of mechanised boats on fish catch as well as on the economy of the traditional fishermen community, the government of India has now opened Indian water to foreign fishing vessels. Both traditional and mechanised sectors are protesting against the invasion which will have a disastrous impact on the economy and the social life of fisherfolk.

J. Rajan (1995)[30] attempted to assess the impact of Matsyafed on the socio-economic development of fishermen assisted by Matsyafed vis-à-vis the non-beneficiary fishermen. It aimed at examining the popularity and effectiveness of four major activities of the Matsyafed among fishermen like co-operativisation, input supply, market intervention and extension work. The methodology adopted was an empirical one based on survey method. It utilized both primary and secondary data. Primary data were collected from 30 or more fishermen households selected from three zones; southern, central and northern regions by adopting multistage sampling. The study found that there is considerable difference in the social conditions of fishermen of different regions of coastal Kerala. The central region is ahead in the cases of literacy, aspiration towards children's education, attitude towards higher education, size of family, drinking water facilities, good sanitation facilities etc. In the case of health conditions of fisher folk, northern region is ahead. With regard to the impact of Matsyafed in traditional sector in co-operativisation and distribution of fishing input assistance the Matsyafed has made commendable achievement. But in market intervention, implementation of extension work they appear to have

failed. The study also revealed considerable variation between the beneficiaries in their social and economic conditions.

Jacob Mani (1995)[31] studied the problems of marginalisation among traditional fishermen in Kerala. The major objectives of the study were centered on assessing the extent of problems of marginalisation of fishermen community and the possible cause of deprivation in a political angle. He also aimed at studying the impact of the programmes of governmental organizations and non-governmental organizations on the socio-economic and health status of the community. The sample of study constitutes traditional fisher folk, mechanised boat fishermen, political elites and NGO's. Stratified random sampling procedure was followed to assure representation to all relevant sections of society. The study concluded that the economic and political marginalisation of fishermen in Kerala started only in the 1950's with the commissioning of INP in Kerala. He also claimed that the INP caused resources depletion and the common property resources are being encroached upon mainly by industrial classes. He also claimed that irrespective of the political affiliation of Governments vacillated in their policies, regarding problems related to traditional community. He concluded that this community is one of the few and rare sectors in Kerala whose progress have been continuously stagnated.

K.M.Shajahan (1996)[32] made an attempt to review the deep sea fishing policy announced by the Government of India in March 1991 on the grounds of serious debates among the academic community and traditional/small scale mechanised fishing sector. The government justified their policy by pointing the necessity to exploit the deep sea resources which are not up to the capability of traditional /small scale mechanised fishing sector. This resulted in the operation of big DSF vessels in Indian exclusive economic zone and because of the continuous agitations from fisherfolk, Government of India appointed a committee to look into the operations of DSF vessels in Indian EEZ

headed by D.Sudarsanan, Director General, Fisheries Survey of India, Bombay. The article was structured in such a way so as to analyse the issue with regard to the suggestions of Sudarsan Committee. He was of the view that the report of Sudarsan Committee reading the operations of deep sea fishing vessels on which is based the proposed deep sea fishing policy, was an attempt to divert the attention of the fishermen community and the public at large from the dangerous repercussions of extensive fishing operations conducted by joint venture/chartered DSF vessels in the Indian seas.

P.K.Babu (1996)[33] made a study with major objectives of examining the socio-economic and demographic characteristics, level of knowledge of fisherfolks on facilities concerning family planning and their sexual behaviour. The study was concentrated in Alappuzha because Alappuzha stood first in female literacy among the nine coastal districts. Towards this purpose 500 households from selected five fishing villages, were selected for the study. The major findings of the study were that the fisherfolk showed high literacy rates and the concept of nuclear family has been well accepted by them. Eventhough they are unable to maintain a hygienic environment, their housing conditions are fairly satisfactory. They are well exposed to health and family planning information and have good sex lives with woman having higher fertility rates.

Peter Reeves, Bob Pokrant, John Mc Guire (1997)[34] in their symposium draft copy explains the struggle of artisanal fishers in Kerala since 1980. They explained the struggle by fishers in three phases. In the formative phase (1960-1970) the fishers' organisations at district, state and national level were being formed. In this phase the influence of Roman Catholic Church was very evident. The second period was the period of agitation and struggle (1980 to 1990) when they brought pressure on successive Governments. The last period comes in the 1990 when the issues which the Kerala fishers had been fighting for increasingly

become national issues. They concluded by saying that the Kerala tells a story of almost three decades of unprecedented organisation among fishers as a result of their disadvantages and as a result of interference from groups like the clergy.

Staff reporters (1998)[35] of The Deepika prepared a detailed report which narrated the problems faced by mechanised boat owners due to lack of catches and heavy operational costs. Many have committed suicide due to heavy indebtedness. Many of them were got involved in heavy debt traps. Absence of financial assistance from banks and governmental agencies were also detailed in the report entitled 'Ozhiyunna Madisheela, Thakarunna Keralam'.

Tomy Vattavanal (1998)[36] through his report published in The Deepika daily recorded the pathetic condition of the fisherfolk in Kerala coast. It explained the poor living conditions of fishermen and their sufferings especially during the monsoon season.

Sasikumar Pandanadu (1998)[37] in his report explains the changes that had occurred in lives of fisherfolk through the activities made by Don Bosco Salesian Priests by organizing Fishermen Community Development Programme (FCDP) and the emergence of Kerala Swathanthra Matsya Thozhilali Federation. The report also dealt upon the panic situation that existed in the coastal Kerala and emergence of conflicts between traditional and mechanised fishermen. The report said that motorisation and mechanisation process raised the cost of operation and thereby reduced income of fisherfolk.

Dilip Philip (1999)[38] in his feature published in Business Deepika reported the panic situation of sea food processing units in Kerala which provides employment to lakhs. The main reason behind this was explained as lack of sea wealth, especially fish. Unscientific and restless fishing was considered as the major reason for resource depletion. The reports also shed light on the need for banning mini-trawling operation.

Abdul Aziz (1999)[39] stated that unscientific fishing destroyed the foundation of prawn industry. Using banned nets, practice of night fishing and unscientific fishing caused resource depletion. He also observed that there was the lack of strict regulations in Kerala for preserving the marine wealth.

Anannya Bhattacharjee (1999)[40] in the interview report with Thomas Kocherry, the leader of fishermen movements of Kerala, explains the fishermen's agitation as a result of mechanisation and panic condition of fisherfolk due to mechanised trawling in India and other countries. The article also explains the structure and style of the fishermen struggle in India.

Antony Gregory & G. Placid (June 2000)[41] explained the fishermen's struggle against mechanised fishing in Kerala. The report explains the Government's policy for allowing mechanised fishing in the inshore waters of Kerala which resulted in a reduction in income level of artisanal fishers. The rapid mechanisation also ensures that resourceful entrepreneurs take over the resources that had traditionally belonged to the artisanal fisher folk, led to the destruction of their livelihood. It explains the genesis of fisherfolk movement, development of fishermen organizations and its demand and struggles.

Tonnes Bekker- Nielson (2002)[42] explained the technology and productivity of ancient sea fishing. It explains the literal background of ancient fishing and types of fishing with different crafts and gear.

P.K. Krishna Kumar and Ashwin Panchal (2003)[43] reported in Business Express, the importance along with problems faced by seafood exporting Industry. It stated that in Kerala, the 45 days' trawling ban imposed by the state government means lesser catch from the sea in monsoon season. It also stated that the chief problem bugging exporters at the moment was the shortage of catch.

G. Henry (2003)[44] conducted a study to assess the impact of mechanised fisheries on the real fishermen owners by identifying the various groups of owners and the technical properties of their boats. It also analysed the capitalist features that emerged in the fisheries sector and the course of developments in the field of mechanised fisheries at Sakthikulangara. The study was organized in the form of a case study at Sakthikulangara. Primary data regarding ownership, operation and management of the boats of the fishermen owners as well as on their socio-economic profile were collected by using a structured questionnaire. The major findings of the study proved that the mechanised boat owners got fragmented into five groups such as owners of single second-hand boats, owners of single new boats, owners of two boats, owners of three boats and owners of a fleet of over ten boats. The study also revealed that there are considerable differences in technical features and competencies of boats and with regard to fishing, stay-over fishing has come into being. The capital requirement turns to be very high and the boat owners with inferior assets have only a poor quality of life.

Cochin Bureau of Jeevan News (2004)[45] reported that even after repeated researches were being conducted in the field of fishing, particularly in relation to night trawling and ring seining that would not generate any good results in fishing. They argued that crores of rupees spent in this regard is a sheer waste. The government or / and agencies could not take even a single step for implementing the research results.

George Joseph (2004)[46] of Surya Television News Bureau reported that foreign trawlers were operating in the seas of Kerala during trawling ban period. The continuous demand made by boat operators and traditional fishermen regarding banning of foreign trawlers in our waters was of no use. During trawling ban period they were entering into the inshore area causing total destruction of marine wealth.

Mary Antony (2004)[47] in her article made an attempt to review the history of trawling ban and also tried to evaluate it with respect to the results there of. She cites the poor starving condition of marine fishermen during trawl ban period.

Staff reporter (2004)[48], Deshabhimani daily reported the history of trawling ban and its impact on coastal Kerala in the eve of trawling ban. The demand of total ban by boat owners was also stated in the report. Government's implementing strategies were also specified in the report.

Staff reporter (2004)[49], Deshabhimani daily cited the names and tenure of different committees appointed by government of Kerala to study the mechanisation process and preservation of marine wealth. It stated different committees such as Dr. Babu Paul Committee (1981) A.G. Kalawar committee (1985) and N. Balakrishnan Nair committee (1989 & 1998) appointed by state government. It also stated the Murari Committee (1996) and Dr. K.Gopakumar Committee (2000) by Central Government. The report stated that eventhough different committees were appointed no strict measures were taken for the implementation of the suggestions till date.

Sanjeeva Ghosh (2004)[50] in his article published in Kerala Calling discusses the environmental degradation due to indiscriminate "bottom trawling" causing severe depletion of the regenerating and renewable aquatic resources, predominately the marine fishes. He identify fishing by mechanised trawling as the most dangerous environmental intervention to the marine aquatic system. The article also explained the origin of mechanised trawling in Kerala and the geneses of trawling ban and the need of it.

Staff reporters (2005)[51], Malayala Manorama mentions different problems faced by the fishing sector. The crisis situation affected the life of different groups from fish vendors to the mechanised fishing vessel owners. Closed peeling sheds, non-operating ice plants, shutdown

freezing plants to the struggling traditional fishermen reflects the situation. The fisherfolk of Kerala raised voice against the problems like depletion of marine wealth, resting of the eco-system etc. but the government is not bothered about these problems. The present move of government to import fish from Thailand will raise the problems of this particular sector. The article also pointed out the problems regarding trawling ban and the absence of a serious scientific study thereon. They quoted Dr. Sunil Mohammed to prove that the procreation of fishes happened all around the year. Examining the pros and cons of the trawling ban in connection with the socio-economic health condition of fisherfolk, an analysis of the marginalized group in the fishing sector due to mechanisation is made. The divergent views of different workers belonging to different sectors of fishing industry are also taken into account. The fish workers' comments regarding the governmental and other agencies' support and the newly emerged problems like Tsunami were also attended to.

The above discussed studies and reports throw light on the manifold aspects of fishing industry in the state of Kerala. It examined the impact and dispute of trawling ban, the socio-economic and health condition of fish workers. Also analysed the marginalized group in the fishing sector as a result of mechanisation. If we closely observe the above mentioned studies and reports, it is clear that no studies were carried to measure the impact of mechanisation both on workers and owners of the fishing field by considering the reality of the co-existence of traditional non-motorised sector, traditional motorised sector, and the mechanised sector in the fishing industry in Kerala. It is in this back ground the present study is proposed.

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CHAPTER III

FISHING INDUSTRY – AN OVERVIEW

Men have eaten fishes since the earliest times and for centuries have gone to sea to catch them. Chambers 21st Century Dictionary states fish as any of various water-inhabiting creatures; it also states fish as any cold blooded aquatic vertebrate that has no legs, and typically possesses paired fins, breathes by means of gills and has a bony or cartilaginous skeleton and a body covered with scales[1] Fish occupies a dominant place in Indian mythology, tradition and history. According to the Hindu mythology the first incarnation of Lord Mahavishnu was as fish (Matsyaavatharam)

Wikipedia, the free online encyclopedia describes 'fishing' as the activity of hunting for fish. By extension, the term fishing is also applied to hunting for other aquatic animals such as various types of shellfish as well as squid, octopus, turtles, frogs and some edible marine invertebrates.[2] Fishing is an ancient and world wide practice with many techniques and traditions. It has been transformed by modern technological developments.

The origin of fishing dates back atleast to the Mesolithic Period which began about 10,000 years ago. Fishing precedes even agriculture. From time immemorial, when man started his struggle for existence, he always relied on the vast and wide waters. Ancient civilizations keenly flourished on the banks of the rivers and naturally man found fishing, hunting and farming as his primary occupations during the early stages of origin of civilizations.[3]

The ancient river Nile had plenty of fish. Hence in Egypt fresh and dried fish were the staple food for much of the population. The Egyptians invented various techniques and methods for fishing and these are clearly illustrated in tomb scenes, drawings and papyrus documents- Simple reed boats served the fishermen. Nets were woven; weir baskets were made from willow branches; harpoons and hook and line were used. The hooks used earlier had length between eight millimeters and

eighteen centimeters and by the 12th dynasty metal hooks with barbs were used. Fishing scenes are rarely represented in ancient Greek culture, a reflection of the low social status of fishing. There is a wine cup, dating from 510-500 BC, that shows a boy crouched on a rock with a fishing rod in his right hand and a basket in his left.[4] In the water below is a rounded object of the same material with an opening on the top. This has been identified as a fish-cage used for keeping live fish, or as a fish trap. This object is currently available in the Museum of Fine Arts, Boston.

There are numerous references to fishing in ancient literature; in most cases, however, the descriptions of nets and fishing-gear do not go into detail, and the equipment is described in general terms. An early example from The Bible, in Job 41:7, "Can't thou fill his skin with barbed irons? Or his head with fish spears?" Oppian of Corycus, a Greek author wrote a major treatise on sea fishing-The Halieulica or Halieutika, composed between 177 and 180.[5] This is the earliest work to have survived intact to the modern day. Oppian describes various means of fishing, including the use of nets cast from boats, scoop nets held open by a hoop, spears and trident, and various traps 'which work while their masters sleep.'

There had been fishermen in Israel beyond the memory of man. Archeologists have dug up weights for nets, needles for repairing them, and fish boats. The Gospel is filled with scenes from the life of fishermen. Christ took his first disciples from among them, and his teaching has a great number of figures taken from their calling.[6]

From ancient representations and literature it is clear that fishing boats were typically small, lacking a mast or sail, they were only used close to the shore. In traditional Chinese history, history begins with three semi-mystical and legendary individuals who taught the Chinese, the arts of

civilization around 2800-2600 BC; of these Fu Hsi was reputed to be the inventor of writing, hunting, trapping and fishing.[7]

From ancient times man knew the taste and deliciousness of fish. Both marine and fresh water fishes were eaten by him. He used fish as one of his most delicious and cheapest food. The importance of fish to the human body was discovered later on. Fish contains proteins, vitamins and essential oils in plenty. It inspired man to think about producing marine products in large scale. Early man adopted primitive methods but today complex computers are used to detect the presence of fish in the sea.

3.1 Fishing Techniques

Following are some of the traditional fishing techniques employed:

3.1.1 Hand fishing

It is possible to fish with minimal equipments by using only the hands. In the USA catching catfish in this manner is known as Noodling and in British Isles, the practice of catching trout by hand is known as Trout tickling.[8] Divers can catch lobsters by hand. Pearl diving is the practice of hunting for oyster by free-diving to depth of up to 30m. The fishing by hand in Kerala is known as Thappal.

3.1.2 Spear and bow fishing

Spear fishing is an ancient method of fishing and may be conducted with an ordinary spear or the trident. Traditional spear fishing is restricted to shallow waters, but the development of the spear gun has made the method much more efficient. Spear guns or harpoons are nowadays used for hunting whales in the deep seas.

3.1.3 Fishing nets

All fishing nets are meshes usually formed by knotting a relatively thin thread. A small hand net held open by a hoop and possible at the end of

a long stiff handle has been known since antiquity. It may also have been used for sweeping up fish near water surface. Some well known traditional nets are:

- A casting net is circular with a weighted periphery. Sizes vary up to about 4m in diameter. The net is thrown by hand in such a manner that spreads out on the water and sinks. Fish are caught as the net is hauled back in.
- The Chinese fishing nets (Cheenavala) found at Kochi and all over Kerala are dipped into the water from their fixed spots and raised again, but otherwise cannot be moved.[9]
- A Seine is a large fishing net that hangs vertically in the water by attaching weights along the bottom edge and floats along the top.
- A gill net[10] catches fish which try to pass through it by snagging on the gill covers, thus being trapped, the fish can neither advance through the net nor retreat.
- Ghost nets[11] are nets that have been lost at sea may continue to be a menace to wildlife for many years.
- Trawling[12] is a method of fishing that involves actively pulling a fishing net through the water behind one or more boats.

3.1.4 Dredging

There are different types of dredges used for collecting scallops or oysters from the seabed. They tend to have the form of a scoop made of chain mesh and are towed by a fishing boat. Scallop dredging[13] is very destructive to the seabed, and nowadays often replaced by scuba diving to collect the scallops.

3.1.5 Fishing lines

Fish are caught with a fishing line by encouraging a fish to bite upon a fish hook or a gorge. A fishing hook will pierce the mouth parts of a fish

and being barbed it makes escape less likely. Fishing with rod and line is called angling.[14] Long-line fishing is a commercial fishing technique which uses hundreds or even thousands of baited hooks hanging from a single line.

3.1.6 Kite-fishing

Kite-fishing was invented in China and was also known to the people of New Guinea and other Pacific Islands.[15] A large leaf stiffened by the ribs of the fronds of the coconut palm with a fishing line made from coconut fiber and lure made from spiders webs are used in kite-fishing.

3.1.7 Fish traps

Traps are culturally universal and seem to have been modelled independently suiting the course of the water and the easiness of the task. There are essentially two types of traps, a permanent or semi-permanent structure placed in a river or tidal area and pot-traps that are baited to attract prey and periodically lifted.[16] Kuttivalas and Cheenavalas of Kerala are examples of this variety.

3.1.8 Fishing with the help of trained animals

In China and Japan the practice of cormorant fishing is thought to date back some 1300 years.[17] Fishermen use the natural fish-hunting instincts of the cormorants to catch fish. A metal ring placed round the birds neck prevents large, valuable fish being swallowed, thus the fishermen collect the fishes. Dating from the 1500s in Portugal, Portuguese waterdogs were used by fisherman to send messages between boats, to retrieve fish and articles from the water, and to guard the fishing boats.

3.1.9 Toxins

Many fish hunters use poisonous plants to stun fish so that they become easy to collect by hand. Some of these poisons paralyze the fish, others are thought to work by removing oxygen from water. This is an illegal way of fishing and it occurs mainly in the Philippines, Indonesia and the

Caribbean to supply the requirements of 2 million marine aquarium owners in the world.[18]

3.1.10 Explosives

Dynamite or blast fishing[19] is not only easy but also cheap. With dynamite or home made bombs made from locally available materials fishes are killed by the shock waves from the blast and are then skimmed off the surface or collected from the bottom. These explosives indiscriminately kill large number of fish and other marine organisms in the vicinity and even destroy the physical environment.

Man extracts about seventy million tones of food annually from the oceans by fishing. The food producing potential of the sea, however, is estimated as high as seven billion tones a year. Fishing techniques range from the primitive to ultramodern -electrical, electronic and acoustical fishing methods.[20]

3.2 The World Scenario

Fishing is perhaps one of the oldest industries in the world. Fishing is a kind of primary production such as mere collection or gathering or catching. To begin with, men have used their hands to collect and capture fish and other aquatic animals along the shores of lakes, rivers and seas. Gathering by hand is the simplest form of fishing practised since ancient times by roaming nomads, and is practised even at present in many parts of the world, such as in the modern north-west European Countries, where fishing by foot is also practised.[21]

As the human family units expanded into tribal units, planned fishing operations must have developed. Then man developed various gears for fishing, among them spear appears to be the earliest weapon to be employed and is still used in certain parts of the world. This was followed by some kind of primitive and stationary traps made up of twigs in the form of baskets, suitably baited and designed to entrap

roving fish. The present Cheenavalas are its advanced version. From such structures, more efficient structure made of stones or rubbles of semi-circular shape and with the bank of the sea or estuary on one side were devised for trapping fishes entering into them during the high tide, similar to fish corals found in Britain and Kuttivalas of Kerala.[22] Since shoaling fishes may not be available quite close to the coast, man must have devised methods for his transport from the coast to the shallow coastal waters, probably with the aid of floating wooden pieces or logs fastened together. This led to the development of fishing crafts. In the beginning long sticks such as of bamboo or other wood might have been used for propelling the log systems, followed by innovation of wooden oars and subsequent discovery of the usage of sails to utilize the wind power for propulsion.

Development of rudders to change the direction of movement of the log systems as well as the development of dug-out canoes and plank-built boats must have followed thereafter. The discovery of steam energy for propulsion and navigation, iron and steel construction of vessels and utilization of oil engines and motors are part of recent history in the development of fishing crafts, and considered as the ultimate stages in the efforts for locating fish shoals far and wide.[23] These are all the developments that took place in the catching strategy of fishing industry. The present day fishing industry is a combination of three major operations such as catching, processing and marketing.

3.2.1 Consumption, Production and Trade

Fish enjoys a very special consideration and place in human civilization from ancient times. At first, from the consumption point of view, among the fish consuming countries, Japan exploits most the surrounding seas teeming with fish than any other country does, to meet most of its food requirements. According to FAO statistics, countries may be classified on the basis of their per capita consumption of fish as follows:

a) Very high (20kg or above) – Iceland, Norway, Sweden, Burma, Japan and Philippines.
b) High (from 10kg upto 20kg) – Belgium, Denmark, England, Holland, Portugal, Germany, Spain, South-Korea, Malaya and Central American Countries.
c) Medium (from 5kg to 10kg) – Finland, Greece, France, Italy, Luxemburg, Canada, USA, Chilie, Venezulea and Australia.
d) Low (less than 5kg) – Ireland, Yugoslavia, Switzerland, Mexico, India, Turkey etc.[24]

Then, with regard to the other areas like catching, farming, processing, packing, storing, exporting etc. of seafood, countries like Philippines, Japan, Thailand, Taiwan, Indonesia, China etc. take the lead.

In 2001, total fisheries production (excluding aquatic plants) was reported to be 130.2 million tones, of which 37.9 million tones came from aquaculture practices. World capture of fisheries production decreased from 95.4 million tones in 2000 to 92.4 million tones in 2001.[25] Major fluctuations in capture production in recent years were mainly due to variations in catches of Peruvian anchoveta which are environmentally driven (ie.El Nino). In fact global capture production excluding achoveta has remained fairly stable since 1995.In 2001, according to reported statistics China was the leading producing country with 16.5 million tones, showing a decrease of 2.7% compared to 2000. China was followed by Peru (8.0 million tones), the USA (4.9 million tones), Japan (4.7 million tones) and Indonesia (4.2 million tones).[26]

3.2.1.1. Leading Fish Producing Countries

The statistics regarding leading fish producers up to 1988 is depicted in table 3.1.

Table 3.1

Distribution of Leading Fish Producing Countries of the World (Fish Landings in Million Tones)

Sl. No.	Countries	1980	1981	1982	1983	1984	1985	1986	1987	1988	CGR
1.	Japan	10.43	10.74	10.83	11.25	12.02	11.41	11.98	11.84	11.84	113.52
2.	USSR	9.52	9.57	9.99	9.82	10.59	10.52	11.26	11.16	11.33	119.01
3.	China	4.24	4.38	4.93	5.21	5.93	6.78	8.00	9.35	10.36	244.33
4.	USA	3.65	3.79	4.03	4.32	4.99	4.95	5.17	5.99	5.97	163.56
5.	Chile	2.82	3.39	3.67	3.98	4.50	4.80	5.57	4.81	5.21	184.75
6.	Peru	2.71	2.72	3.51	1.57	3.32	4.14	5.61	4.58	6.64	245.01
7.	India	2.44	2.44	2.37	2.51	2.86	2.82	2.92	2.91	3.14	128.68
8.	Rep. of Korea	2.09	2.37	2.28	2.49	2.48	2.65	3.10	2.88	2.70	130.62
9.	Indonesia	1.84	1.91	1.99	2.26	2.25	2.33	2.46	2.58	2.70	146.74
10.	Thailand	1.80	1.99	2.12	2.26	2.13	2.23	2.54	2.17	2.17	120.55
	Total	41.54 (57.67)	43.30 (58.05)	45.72 (59.61)	45.58 (58.88)	51.07 (60.94)	52.63 (61.03)	58.61 (63.31)	58.27 (62.45)	62.09 (63.75)	149.47
	World Total	72.03 (100)	74.59 (100)	76.70 (100)	77.41 (100)	83.80 (100)	86.24 (100)	92.58 (100)	93.30 (100)	97.39 (100)	135.20

Source : Kerala Fisheries Facts & Figures 1990, Dept. of Fisheries, Govt. of Kerala, 1991, p.88. Note: Figures in brackets indicate percentages

The compound growth rate presented in table 3.1 states that countries like Peru, China, Chile, USA etc. recorded a high rate of growth during the 9 years from 1980 to 1988. This itself is an evidence of the fact that by 2000, these countries could take the lead in fish production. The table 3.1 also reveals that the leading ten countries itself contributed for above 60% of the world fish production. In the year 1988 the percentage to total fish production by the leading countries fetched 62.09 percent.

About 38% (live weight equivalent) of world fish production entered international trade in 2001. The 86 Low Income Food Deficit Countries

(LIFDCs) accounted for 19% of total exports in terms of value. Developing countries as a whole, supplied slightly more than 50%. The net receipts of foreign exchange for fishery commodities by developing countries (i.e., deducting their imports from the total value of their exports) increased from US $ 4.0 billion in 1981 to US $17.7 billion in 2001. This amount was greater than the net exports of other agriculture commodities such as rice, cocoa, tobacco and tea.[27] For obtaining a more clear picture on international trade on fisheries, the statistics regarding leading exporters and importers need to be looked into.

3.2.1.2 Leading Fish Importers in the World

The top ten fish importing countries during the period 1978 to 1987 is depicted in Table 3.2.

Table 3.2

Distribution of Leading Fish Importing Countries of the World (1978-1987)

Q-Quantity in 000 tonnes V. value - Million US$

[Table spans multiple columns with data for years 1978-1987, showing Quantity (Q) and Value (V) for countries: Japan, USA, France, Italy, U.K., Spain, Federal Rep. Of Germany, Denmark, Hongkong, Belgium, with Total and Total world imports rows]

Source : FAO year book of Fishery Statistics & Kerala Fisheries facts and figures 1990, Dept. of Fisheries, Govt. of Kerala, 1991, p.19. Note : Figures in brackets represent percentage

Table 3.2 states that almost 55% of the quantity of total imports and above 75% of the value of total imports are contributed by the top ten fish importers of the world. With respect to the growth rate computed the future leading importers will be Spain, Hong Kong, Japan etc.

While looking in to the latest available statistics it is found that in 2001, more than 80% of the total world import value was concentrated in the developed countries, in particular Japan, the USA and several European Union countries. Japan was the major importer accounting for about 23% of total import. The USA was not only the second main importer, with a share of 17%, but also the fourth main exporter. The USA was followed by Spain, France, Italy, Germany and the UK.[28] To have a clear picture regarding international trade on fisheries, the export figures are also to be looked into.

3.2.1.3 Leading Fish Exporters in the World

The available statistics regarding major fish exporting countries of the world during 1978 to 1987 is depicted in Table 3.3.

Table 3.3

Distribution of Leading Fish Exporting Countries of the World (1978-1987)

Q-Quantity in 000 tonnes V. value-Million US$

[Table spans multiple columns with data for years 1978-1987, showing Quantity (Q) and Value (V) for countries: Canada, USA, Denmark, Korea, Norway, Thailand, Iceland, Netherlands, China, Japan, with Total and Total world Exports rows]

Source : FAO year book of Fishery Statistics & Kerala Fisheries facts and figures 1990, Dept. of Fisheries, Govt. of Kerala, 1991, p.19. Note : Figures in brackets represent percentage

Considering the growth rate of exports in terms of quantity the USA and China are clearly ahead of others, however on the basis of value of exports Thailand and China dominate the rest. 45 to 50% of the total exports, both in quantity and value are from the above stated countries. In the stated 10 years, the quantity of exports of the major exporters increased to 170.10%, whereas the value of exports rose by 222.53%. In

the meantime the world wide export of marine products increased by 171.74% in quantity and 242.34% by value.

3.2.1.4 Leading Shrimp Producing Countries

While analysing the marine products exports, it is seen that shrimp, tuna, groundfish, squid and cuttlefish are some of the species which have good demand in world markets. In 2001 also Shrimp continued to be the main fish commodity traded in terms of value, accounting for about 19% of the total value of internationally traded fishering products.[29] Other main groups of species exported are groundfish, tuna and salmon. Exports of developing countries mainly consisted of tuna, small pelagics, shrimp and prawns, lobsters, cephalopods, fish meal and fish oil.

Shrimp being an important item of export, it is better to know the leaders in shrimp production. The table 3.4 depicts the top ten shrimp producing countries of the world.

Table 3.4

Distribution of Leading Shrimp Producing Countries of the World (1978-1987)

Q-Quantity in 000 tonnes

[Table shows data for years 1980-1988 with Growth rate for countries: China, India, Indonesia, USA, Thailand, Mexico, Ecodor, Malaysia, Philippines, Greenland, with Total and Total World Production rows]

Source : FAO year book of Fishery Statistics & Kerala Fisheries facts and figures 1990, Dept. of Fisheries, Govt. of Kerala, 1991, p.89. Note : Figures in brackets represent percentage

The top ten countries alone contribute more than 65% of the world's shrimp production. In the year 1983, it even fetched 90.62%. The growth of shrimp production is very high in certain countries like

Ecuador, Philippines and China. But countries like India showed a declining trend in production of shrimp.

3.3 The Indian Scene

Profuse reference to fish are found in the great epics of the country, in the stone carvings and paintings. Historically, reference to fish, its trade and fisher community are found in the songs of the Sangam Age (1st to 4th Century AD) and in the diaries and records of travellers to India like Pliny and anonymous author of the "Periplus of the Erythraen Sea" early in the first century AD. Records also show that in the 18th century Salt-fish trade flourished along the western cost of India. Traditionally, fishing has been the principal avocation for the livelihood of a segment of the population living in the coastal region, and on the banks of rivers, lakes and canals.[30]

Sea fishing has been an occupation with the coastal people of India from time immemorial forming an integral part of the community's maritime heritage. Fishing operations have, however, largely remained near the shores, venturing out into the open sea only a few kilometers from the base up to distances which could easily be covered by sailing craft. The occupation of fishing, in general, was considered an inferior profession in society and this, coupled with the prohibition of travel on the sea, commonly referred as 'Kalapani', prevented the induction of capital and organization from more resourceful communities. Naturally, only the traditional community of fishermen developed the industry for centuries.

Prior to independence, fisheries that in the maritime states had reached considerable proportions, was viewed principally as a source of revenue and barring notable exceptions like the erstwhile Madras Province, hardly received any encouragement from the government towards development. Considering the circumstances under which the community of marine fishermen had evolved different techniques of

fishing, built various types of crafts and gear and successfully applied indigenous methods of preservation, it can be stated that the industry had reached a high degree of viability by the time of Independence.[31] However, in comparison with the contemporary status of marine fishing in Industrially advanced countries, India's progress was tardy.

In the present context the fisheries sector has a pride of place in the national economy of India. This sector along with seafood and ancillary industries provides gainful employment to over 4 million people. The fishing industry is making valuable contribution both to our domestic food supply and exports. The marine potential is enormous but only a small percentage of the same is currently being exploited. By the year 1990 India reached seventh position among the fish producing countries of the world and the second position among the shrimp producing countries.[32] Moreover the fisheries sector accounts for substantial share of animal protein intake of the people. India is endowed with a coastline of 7516 km. with 0.42 million sq.km. area within the continental shelf and a 2.02 million sq.km. area within the Exclusive Economic Zone.[33]

Fishing industry in India recorded a steady growth in the second half of the eighties, but the nineties witnessed stagnation in the case of marine landings. The development of fishing industry needed a "technological chain" extending from mechanised vessels to fishing harbours, cold storages, ice making units, fish processing plants, refrigerated rail/road transport, quality control and inspection service. In a country like India increased landings of fish calls for application of modern and scientific methods in landing, preservation and distribution in order to derive maximum advantages of our natural resources and in assisting as well as improving the socio-economic conditions of lakhs of fishermen engaged in this field. Many changes have taken place in the three sectors of the fishing industry. In the primary sector, i.e. in the catching branch, introduction of mechanised boats and use of synthetic materials are the prominent changes. Nowadays mechanised vessels use the most

advanced fish detection devices. The secondary sector of the fishing industry, i.e. processing sector, has been showing positive changes including introduction of harbour facilities and quality control. The change in the tertiary sector involves the introduction of foreign markets, development in transportation facilities, new methods of distribution. etc.

India's position with regard to fish production is clear from the table 3.5

Table 3.5

Share of India in World Fish Production

Sl.No	Year	World production	India	% to world production
1	1950	19755	730	3.70
2	1960	36691	1161	3.17
3	1970	67279	1759	2.61
4	1980	75585	2445	3.24
5	1990	97590	3794	3.89
6.	1991	84545	4044	4.78
7.	1992	85418	4173	4.88
8.	1993	86589	4546	5.25
9.	1994	91586	4736	5.17
10.	1995	91871	4831	5.25
11.	1996	93531	5202	5.56
12.	1997	93766	5379	5.72
13.	1998	86933	5244	6.03
14.	1999	92867	5135	5.53
Mean Production for the last ten years		90469.6	4708.4	5.20

Source: Facts &Figures-2000-Dept. of Fisheries, Kerala, 2002.p.32.

On an average, India contributed about 5% of the total world fish production. During the year 1998 it even fetched 6%. As our marine potential is enormous government now emphasises on the need to

exploit the deep sea. Therefore, the present initiatives in the marine fisheries sector are focussed to promote deep sea fishing rather than inshore fishing.

The state wise area of potential fishing grounds are depicted in Table 3.6.

Table 3.6

State wise Area of Potential Fishing Grounds in India

Sl.No	State/Union territory	Area upto 50 meters	Area from 50m – 200 m	Hectares (total)
1.	West Bengal	994	2286	3280
2.	Orissa	1707	2363	4070
3.	Andhra Pradesh	1661	3104	4766
4.	Tamil Nadu & Pondicherry	2326	4142	6468
5.	Kerala	1257	3594	4851
6.	Karnataka	794	2547	3341
7.	Goa	285	998	1283
8.	Maharashtra	2551	10476	13027
9.	Gujarat	6481	9937	16418
10.	Andaman	-	1533	1533
11.	Nicobar	-	73	73
12.	Lakshadweep	-	434	434

Source: Kerala Fisheries facts & figures 1990-P.5, CMFRI Bulletin No.27, March 1976

The leading states possessing more potential areas for fishing are Gujarat, Maharashtra, Tamil Nadu, Pondicherry, Kerala and Andhra Pradhesh. Among them Maharashtra has the greatest potential for deep sea fishing followed by Gujarat, Tamil Nadu and Kerala. For exploiting the marine resources in the Exclusive Economic Zone (EEZ) of India presently there are about 30,000 motorised boats, 181 deep sea fishing vessels, 35,000 mechanised vessels, 6 tuna longliners and 1,80,000

traditional crafts prowling the country's 2.02 million sq.km. of maritime EEZ for fish.[34] There are six major fishing harbours, 35 minor harbours and 135 fish landing centres along the 8129 km coastline.[35] To protect the interest of traditional fishermen the Central Government has banned fishing by trawlers and other mechanized vessels within an area of 12 nautical miles from the coast.

The Government has identified some states and union territories as maritime states. The states identified are Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharastra, Orissa, Pondicherry, Tamil Nadu and West Bengal. It also considered that the Car Nicobar Islands can also be turned into a fishing paradise by providing trained manpower.

Around 60 percent of the major fish resources in the world are fully fledged and these resources are in urgent need of conservation. The FAO has observed that 44 percent of the stocks for which formal assessments have been available are intensively or fully exploited, 16 percent were over fished, 6 percent of the known stocks were in need of urgent management. Demersal high value species were over fished and a reduction of atleast 30 percent of fishing effort was required to rebuild the resources.[36]

3.3.1 The Resource Potential

The 200 mile Indian EEZ covers an area of nearly 2.02 million sq.kms. with an estimated stable potential of 3.93 million tones per annum of which nearly 50% is reported to be available in inshore waters and the balance in off-shore and deep sea areas.[37] The Government of India constituted a working group to revalidate the potential yield estimates of marine fishery resources made in 1991 and to estimate the additional harvestable yield that could be obtained on a sustainable basis for different depth zones/region of the Indian EEZ. The salient findings of the working group reports are given below: -

- The total potential yield of the marine fishing resources of the Indian EEZ is revalidated as 39, 34, 417 MT constituting 20, 17, 072 tones of demersal, 1673545 tones of pelagic and 243800 tones of oceanic resources.
- A disturbing trend seen is the substantial reduction of some of the important conventional resources namely elasmobranchs (-97000 t), cat fishes (-72000 t), other Clupecoidsa (-33000 t), ribbon fishes (-17000 t), and Carangids (-209000 t). Research should be directed towards such species inorder to develop strategies for reviving and managing the resources.
- Short term forecasts based on Satellite imageries help in minimising searching time and institutional capabilities to be developed.
- Steps taken for formulation of natural and state level regulation and legislation in Maritime fisheries should confirm to the objectives of the code of conduct for Responsible Fisheries. Ministry of Agriculture, Government of India.

The marine resource potential of India and Kerala is given in Table 3.7

Table 3.7

Marine Resource Potential of India & Kerala

(Lakh tones)

Sl. No.	Area	Demersal Resources		Pelagic Resources
		0-50m Depth	Beyond/ 50m depth	0-50m Depth
1	India	10.36 (100)	6.49 (100)	11.74 (100)
2	South West Coast of India	3.60 (34.75)	1.12 (17.25)	5.89 (50.17)
3	Kerala	2.29 (22.10)	0.56 (8.63)	3.42 (29.13)

Source : Economic Review 2004, State planning board, Thiruvananthapuram, February, 2005, p.97.

Note : Figures in brackets indicate percentage to India.

The marine fish landings in India during 2002 have been estimated at 2.64 million tones.[38] An increasing trend was noticed in the landings of shark, oil sardine, Bombay duck, ribbon fishes, carangide, seerfishes, tunas, penacid prawns and cephalopods. Landings of penacid and non penacid prawns declined.

3.3.2 Fish Landings

The table 3.8 narrates the state wise marine fish landings and its percentage in India. When comparing the state wise marine fish landings with the potential area of fishing, we may be able to know the utilization of marine resource potential available to the country.

Table 3.8

State wise Marine Fish Landings and Percentage to India

Q-Quantity in 000 tonnes

Sl. No	Name of State	1989	%	1990	%	1991	%	1992	%	1993	%	1994	%	1995	%	1996	%
1	Andhra Pradesh	123928	5.33	112822	5.46	121150	5.49	149831	6.97	167933	7.4	Q		Q		Q	
2	Goa	111696	5.38	136352	6.58	66909	3.03	86265	4.01	102120	4.5	Q		Q		Q	
3	Gujarat	327264	15.75	396773	15.9	445594	19.98	462765	20.97	493078	22.28	502162	23.35	507372	22.38	Q	
4	Karnataka	325012	12.08	178393	8.42	144622	6.56	121808	5.51	156199	7.27	218808	10.18	169306	7.47	Q	

5	Kerala	647896	31.17	682990	30.62	656351	29.76	650877	29.46	560971	26.09	509306	23.69	774295	34.16	Q	
6	Lacchadiveep	7634	0.35	9626	0.43	13530	0.61	7634	0.35	7634	0.34	Q		Q		Q	
7	Maharashtra	362339	17.4	315277	14.88	358663	16.26	267681	12.12	328133	15.24	281133	13.08	337465	14.89	Q	
8	Orissa	47034	2.26	64726	2.99	43594	1.97	47622	2.2	66681	3.1	47622	2.22	59591	2.63	Q	
9	Pondicherry	12560	0.59	15511	0.72	10471	0.47	13295	0.57	10196	0.47	10196	0.47	13904	0.61	Q	
10	Tamil Nadu	123000	5.54	309261	13.54	357497	16.21	393776	17.82	357397	16.62	389976	18.14	257127	11.34	Q	
11	West Bengal	35776	1.77	49834	2.3	67299	3.05	78948	3.58	91959	4.27	91959	4.28	75301	3.32	Q	
12	**Total**	**2077020**	**100**	**2165169**	**100**	**2205196**	**100**	**2358262**	**100**	**2290090**	**100**	**2347773**	**100**	**2469**	**100**	**Q**	

Source: FAO year book of Fishery Statistics & Kerala Fisheries facts and figures 1990, Dept. of Fisheries, Govt. of Kerala

Eventhough Kerala is having 4th place in the potential area of fishing, with regard to fish landings, Kerala contributed almost 1/4th of the country's total production. In the year 1996 Kerala's share to India's production was 23.69%, it was a decline when compared to the previous years. In the year 1989 Kerala's share to India's total production was 31.17% and it shows a declining trend. The other leading fish producing states are Gujarat and Tamil Nadu. In 1996 Gujarat contributed 20.80% and Tamil Nadu contributed 18.04% of the country's total fish

production. This revealed the fact that in Kerala, the exploitation of marine resource potential is high when compared to other leading states.

The state wise distribution of pelagic and demersal group of fishes in India is shown in table 3.9.

Table 3.9

State wise Distribution of Pelagic and Demersal Fishes in India

Q-Quantity in 000 tonnes

Sl	Union	1991				1992			
		Pelagic	Demersal	Total	%	Pelagic	Demersal	Total	%
1	West Bengal	33849	27420	67269		38838	39899	78738	
2	Orissa	15903	25311	43524		15675	31675	47625	
3	Andhra Pradesh	69507	52438	121150		89904	59978	149831	
4	Tamil Nadu	357197	132619	357197		206005	151027	383712	
5	Pondicherry	10471	2670	10471		10275	2928	13295	
6	Kerala	360977	206415	565585		332143	223428	565571	
7	Karnataka	69766	75328	144622		56453	65275	121808	
8	Goa	42554	23875	66909		51417	34848	86265	
9	Maharashtra	160550	203875	358663		93003	174678	267681	
10	Gujarat	117187	328636	445594		119417	343938	462765	
11	Andaman Nicobar	6899	4397	13500		6899	6809	7346	
12	Lacchadweep	9708	3822	13530		7346	7684	15030	
	Total	**1196639**	**909497**	**2205126**	**100**	**1148971**	**1029471**	**2269020**	**100**

Source: FAO year book of Fishery Statistics & Kerala Fisheries facts and figures 1990, Dept. of Fisheries, Govt. of Kerala, 1991, p.89.

Both in the case of pelagic and demersal group of fishes in India, the states like Kerala, Tamil Nadu, Maharashtra, Gujarath and Andhra Pradhesh takes the lead. Kerala is the state which accounts for the highest catch of both pelagic and demersal group of fishes in almost all the years.

3.3.3 Export

The total value of marine products export from the country was Rs. 6091.95 crores during 2003-04 indicating a decline of 11.83 percent in rupee realization and 6.61 percent in US dollar realization compared to 2002-03.[39]

The marine export from the country both in quantity and value during the period 1998-99 to 2003-04 is presented in table 3.8

Table 3.10

Export of Marine Products from India

Year	Quantity (in Metric tones)	Value (Rs. in crores)
1998-99	302934	4627
1999-00	343031	5117
2000-01	440473	6444
2001-02	424470	5957
2002-03	467297	6881
2003-04	412017	6881

Source : Economic Review 2004,State Planning Board, Thiruvananthapuram, February,2005,p.103.

The export of marine products recorded a steady growth till 2000-01, but during 2001-02, it decreased and again gained in 2002-03. The highest quantity export was made during the year 2002-03, but its value realization is as same as that which got in 2003-04. This revealed that eventhough the quantity of export decreased in 2003-04, when compared to 2002-03, the value of marine products realized out of its export are the same. This may be because of the increase in price of the marine products in the whole market. India is one of the leading shrimp producing countries of the world. Shrimp is the most important fish species which enjoys good demand in world markets. Tuna, groundfish, squid and cuttlefish etc. have also been exported from India abundantly. So it is better to have a look on the average unit value of frozen shrimp

exported from India to various countries during the period 1997-98 to 2001-02, which is presented in table 3.11.

Table 3.11

Average Unit Value Realization of Frozen Shrimp Exported from India Value in Rs./Kg.

Sl. No.	Countries	1997-98	1998-99	1999-00	2000-01	2001-02	Growth Rate
1	Japan	356.73	416.65	390.87	470.49	389.38	109.15
2	USA	232.17	238.78	283.82	378.79	360.15	155.12
3	UK	205.74	231.06	250.71	290.90	296.59	144.16
4	China	213.39	216.80	275.85	251.86	221.62	103.86
5	France	155.86	196.97	223.10	257.23	287.33	184.35
6	Germany	221.64	231.95	275.29	286.46	309.88	139.81
7	Kuwait	242.94	-	-	644.06	-	265.41
8	Saudi Arabia	150.82	-	-	169.30	171.66	113.82
Overall mean		222.41	255.37	283.27	343.64	290.94	

Source : Economic Review, Planning Commission, Govt. of Kerala, 2004 P.103

The average unit value realization of Frozen Shrimp exported from India shows that on an average around 300 rupees per kilogram is realized from export of frozen shrimp. The mean unit value realization shows an increasing trend and reached almost 350 rupees per kilogram. in the year 2000-01. But it got reduced to Rs. 290.34 per kg in 2001-02. While analyzing the compound growth rate of rupee value realization per kilogram. of shrimp from each country, Kuwait provides highest value. By providing the needed sea products on a regular basis the market in Kuwait with respect to seafood can be exploited. The countries like France, USA, UK and Germany are the other leading shrimp markets and contributors.

The total exports of India and share of marine products in the total export is depicted in table 3.12. This will help us to know the role of marine products export in India's total exports.

Table 3.12

Total Exports of India and Share of Marine Products of India and Kerala (Unit Rs. Crores)

Year	Total Exports	Marine exports		% share of Exports		% share of Kerala in Indias Marine Export
		India	Kerala	India	Kerala	
1980-81	6711	235	95	3.5	1.42	40.43
1981-82	7806	286	125	3.66	1.60	43.71
1982-83	8803	361	141	4.1	1.60	39.06
1983-84	9771	373	141	3.82	1.44	37.80
1984-85	11744	384	148	3.27	1.26	38.54
1985-86	10895	398	138	3.65	1.27	34.67
1986-87	12452	461	165	3.7	1.33	35.79
1987-88	15674	531	183	3.39	1.17	34.46
1988-89	20231	598	221	2.96	1.09	36.96
1989-90	27658	635	241	2.29	0.87	37.95
1990-91	32558	893	314	2.74	0.96	35.16
1991-92	44042	1376	444	3.12	1.01	32.27
1992-93	53688	1768	414	3.29	0.77	23.42
1993-94	69751	2503	622	3.6	0.89	24.85
1994-95	82674	3575	815	4.34	0.99	22.80
1995-96	106353	3501	857	2.86	0.81	24.48
1996-97	117525	3782	936	3.22	0.80	24.75
1997-98	126286	4697	948	3.72	0.75	20.18

Source: Facts and Figures 2001, Department of Fishing, Government of Kerala, P.134.

The table 3.12 reveals that the marine products export from India contributes 3.5 to 4 % of the country's total exports. In the year 1994-95 it was 4.34% and in 1997-98 it slashed down to 3.72%. For having a clear idea about export of marine products, the trend of marine products

exports from India need to be analyzed. The table 3.13 narrates the trend of marine products exports from India.

The table 3.13 states that there is not a uniform trend in marine products export from India. It never maintained a steady flow, but fluctuated till the early eighties. But after the year 1985-86, a steady growth was recorded almost till 1994-95. Thereafter the trend which remains as earlier.

Table 3.13

Trend of Marine Product Exports from India 1969-70 – 1999-2000

Year	Quantity in Tonnes	Value in Crores	Unit value Rs/tones	Unit Index Value	Annual Growth Rate %	
					Quantity	Value
1969-70	31695	33.46	10556.87	100	-	-
1970-71	35883	35.07	9773.43	92.58	13.20	4.80
1971-72	35523	44.55	12541.17	118.79	-1.00	27.00
1972-73	38903	59.72	15351.00	145.41	9.50	34.10
1973-74	52279	89.51	17121.6	162.18	34.40	49.90
1974-75	45099	68.41	15168.85	143.68	-13.70	-23.60
1975-76	54463	124.53	22865.06	216.58	20.80	82.00
1976-77	66750	189.12	28332.58	268.38	22.60	51.90
1977-78	65967	180.12	27304.56	258.64	-1.20	-4.90
1978-79	86894	234.62	27000.71	155.76	31.70	30.30
1979-80	86401	248.82	28798.28	272.79	-0.60	6.10
1980-81	75583	234.84	31070.48	294.31	-12.50	-5.60
1981-82	70105	286.01	40797.38	386.45	-7.20	21.80
1982-83	78175	361.36	46224.5	437.86	11.50	26.30
1983-84	92691	373.02	40243.39	381.2	18.60	3.20
1984-85	86187	384.29	44587.93	422.35	-7.00	3.00
1985-86	83651	398	47578.63	45.68	-2.90	3.60
1986-87	85843	460.67	53664.25	508.33	2.60	15.70
1987-88	97179	531.2	54662.02	517.78	13.20	15.30
1988-89	99777	597.85	59918.52	567.57	2.70	12.50

1989-90	110243	634.99	57599.12	545.6	10.50	6.20
1990-91	139419	893.37	64078.07	606.97	26.50	40.70
1991-92	172000	1375.00	79941.87	757.25	23.40	53.90
1992-93	209025	1768.56	84609.97	801.46	21.52	28.62
1993-94	243960	2503.62	102624.2	972.1	16.71	41.56
1994-95	307337	3575.27	116330.77	1101.94	25.97	42.80
1995-96	296377	3501.1	118169.82	119.36	-3.59	-2.07
1996-97	378199	4121.36	108973.31	1032.25	27.65	17.71
1997-98	385818	4697.48	121753.78	1153.31	2.01	13.97
1998-99	302934	4626.87	152735.24	1446.78	-21.48	-1.50
1999-2000	343031	5116.67	149160.57	1412.92	13.23	10.59

Source: Facts and Figures 2001, Department of Fisheries, Government of Kerala, p.133.

The leading markets for Indian marine products are Japan, USA, European Union Countries, China and the Middle East. The market wise export of marine products from India up to 2003-03 is shown in Table 3.14

During the years 2001-02, 2002-03 and 2003-04 China appeared to be the major market for Indian marine products based on Quantity, but with regard to the value of exports USA, European Union Countries and Japan are the major markets. This may be because, the most preferred item in USA, European countries and Japan are the valuable shrimps. To understand it more clearly the item-wise export of marine products from India need to be looked in to Table 3.15 depicted the item wise export of marine products from India.

Table 3.14

Market wise Export of Marine Products from India

Q-Quantity in 000 tonnes V. value-Million US$

Sl. No	Item	2000-01		2001-02		2002-03		2003-04	
		Quantity	% to total	Value	% to total	Quantity	% to total	Value	% to total
1	Japan	64905	15.29	18207	5.49	18207	5.49	18207	5.49
2	USA	49041	11.55	11453	5.02	11453	3.04	11453	3.04
3	European Union	82572	19.53	11445	5.72	11445	5.72	11445	5.72
4	China	134767	30.75	57123	10.08	57123	10.08	57123	10.08
5	S.E. Asia	52424	12.35	9.04	9.04	9.04	9.04	9.04	9.04
6	Middle East	19051	4.51	3.94	10.71	3.94	10.71	3.94	10.71
7	Others	21602	5.02	22345	4.16	22345	4.16	22345	4.16
	Total	**424470**	**100**	**5957.1**	**100**	**467297**	**100**	**688.13**	**100**

Source : Economic Review, Planning Commission. Govt. of Kerala, 2004.

Table 3.15

Item wise Export of Marine Products from India

Q-in MT and V-in Crore

Item	2002-03		2003-04		% share to total		Variation		Percentage value	
	Q	V	Q	V	Q	V	Q	V	Q	V
Frozen shrimp	134815	4608.31	129768	4013.07	31.50	65.88	-5047	595.24	-3.74	-12.92
Frozen Fin Fish	196322	841.65	138023	620.73	33.50	10.19	-58299	-220.92	-29.70	-26.25
Frozen cuttlefish	41381	417.09	39610	435.18	9.61	7.14	1771	18.09	-4.28	4.34
Frozen squid	37838	384.37	37832	372.92	9.18	6.12	-6	-11.45	0.02	-2.98

Dried items	8178	84.23	12574	145.68	3.05	2.39	4396	61.45	53.75	72.96
Live items	2115	53.66	2341	5110	0.57	0.84	226	-2.56	10.69	-4.77
Chilled items	3350	5914	3779	6404	0.92	1.05	429	4.90	12.81	8.29
Others	43298	432.86	48090	389.23	11.67	6.39	47.92	-43.63	11.07	-10.08
Total	467297	6881.31	412017	6091.95	100	100	-55280	-789.36	-11.83	-11.47

Source: Marine Products Export Development Authority Q- Quantity , V- Value

Table 3.15 revealed that, even though the frozen fin fish export exceeds export of frozen shrimp, in quantity terms-the rupee value realized out of it is less than that of the value realized from export of frozen shrimp. A positive variation was recorded in the export of frozen cuttle fish, dried items and chilled items, while the export of frozen shrimp and frozen fin fish decreased.

Finally, to analyze the exports of marine products, another dimension is used, ie.export of marine products are analyzed based on the port through which it was exported. Table 3.16 exhibits the port-wise export of marine products from India.

Table 3.16

Port wise Export of Marine Produts from India

Q-Quantity in tonnes V. value-in crores

Sl. No	Name of Port	1994-95		1995-96		1997-98		1998-99		1999-2000	
		Q	V	Q	V	Q	V	Q	V	Q	V
1	Kochi	74576	814.96	78682	85376	83708	93796	95043	113708	95043	113708

2	Bombay	46006	312.22	31213	27248	40567	39397	26583	21703	26583	21703
3	Madras	18875	392.78	18302	52745	29657	93397	25583	117103	25583	117103
4	Calcutta	19214	321.11	14044	35.46	14438	42049	16397	37247	16397	37247
5	Vishakapatnam	19811	637.29	10017	608.88	23914	774.96	16397	906.73	16397	906.73
6	Porbandar	51405	243.67	50906	263.82	96735	457.84	178818	715.39	178818	715.39
7	Kandla	32852	174.19	28266	131.96	32896	180.51	38101	211.38	38101	211.38
8	Tuticorin	24653	187.32	12628	191.94	13538	309.95	17918	441.98	17918	441.98
9	JNP	22653	221.12	21144	111.98	28572	216.97	35627	307.67	35627	307.67
10	Bangalore	24658	8.71	11108	7.031	5702	21.26	5414	17.78	5414	17.78
11	Goa	14384	8.71	11931	10.31	8702	35.86	9148	38.35	9148	38.35
12	Delhi Airport	11384	30.3	13998	0	11108	27	8355	38.35	8355	38.35
13	Karunnamkulam	0	30.3	214	3.14	658	0.16	605	0	605	0
14	Peranan	0	0	0	0	21	1839	9055	0	9055	0

15	Brasil	307857	3875.27	295627	3850.11	385818	4974.8	543031	5116.67	543031	5116.67

Source : Facts & Figures 2000. Department of Fisheries, Govt. of Kerala, P.143

Table 3.16 shows that Kochi is the leading port in the case of marine product export, followed by Madras, Bombay, Vishakapatanam etc. The export figures throw light into the fact that Kerala is the primary centre of marine products export from the country.

3.4 Fishing Industry in Kerala

The state of Kerala is a narrow strip of land situated at the South-West coast of the Indian Peninsula with an area of 38,900 sq.km and a population of 318.39 lakh consisting of 154.69 lakh males and 163.70 lakh females (2001). Kerala has the lowest population growth rate compared to other states in India.[40] The state is a lush green land bounded on the east by high hills interspersed with rivers, and on the west by the Arabian sea. The exact position is between 8º18' and 12º48' north and 74º52' and 77º22' east.[41] Kerala is one of the leading maritime states in India. It has 590 km surf-beaten coast line. The area of continental shelf of this coast is about 36,000 km² and the overlying waters are considered to be among the most productive in the Indian ocean.[42] Marine resource potential of south west coast region is estimated to be in the range of 13.2 lakh tones. While that of Kerala is around 7.50 lakh tones.[43] The state is also endowed with rich inland water bodies consisting of 44 rivers (having an area of 0.85 lakh hectors) 30 major reservoirs (0.30 lakh hectors) fresh water ponds and tanks (0.25 lakh hectors) 45 backwater and extensive brackish water area (2.43 lakh hectors). But the inland fish production accounts for only about 11.50% of the total production.[44]

The earliest reference about fishing activities in Kerala are found in the Sangham literature. Fishing was naturally the major occupation of the inhabitants of its coastal belt from time immemorial. The early Sangham classics described clearly the agricultural pattern of the period from first to fifth centuries AD. The land was broadly divided in to five well marked physiographic regions such as Kurinchi or the mountain region, the Marthutham or riverain region including the fertile low lying plains, the Mullai or the forests, the Palai or the sandy region and the Neuthal or the Coastal belt. The five above regions had their own distinct occupations, art, culture etc.[45] In the neuthal region the natural occupation was fishing and they were popularly known as "Parvathas". The society of the fisherfolk was predominantly a subsistence society, but fishing for sale was not completely unknown. Sale of fish was done by women folk while men did fishing. Development of fishing sector on one hand and the exploitation of fishermen community by a minority on the other hand is seen throughout the history of Kerala.

The marine resources of Kerala are obtained from a coast line of 590 km, spread over an area of 36,000 square kilometers. The Kerala coast, popularly known as Malabar coast from very early times, provides one of the richest fishing zones in the world.

Past performance of the fishing sector reveals that the state could tap only around 50 percent of the total fisheries potential. In the marine sector, the activity is largely concentrated in the inshore areas without any serious efforts for using the potential available in the off-shore and deep sea areas. The demersal and pelagic resource potential of the state was already shown in table 3.7. The species wise marine fisheries potential estimated in the depth range of 0-50 m in the state is shown in table 3.17

Table 3.17

Estimated Annual Catchable Potential

Sl.No.	Category	Potential (Tonnes)
1	Oil Sardines	111274 (19.47)
2	Other sardines	12637(2.21)
3	Pomfrets	2226(0.40)
4	Mackerels	48686(8.52)
5	Ribbon fishes	18580 (3.25)
6	Penaeid prawns	64482 (11.29)
7	Cephalopods	18852 (3.30)
8	Others	294580 (51.56)
Total		571317 (100)

Source: Economic Review 2004, State Planning Board, Thiruvananthapuram,p.97.
Note : Figures in parantheses denote percentage

3.4.1 A Three Tier Dimension of Fishing Industry

Fish and fisheries plays a crucial role in the well-being of Kerala's economy. Although the coastline is only about one-tenth of the whole coast line of India, the landings in Kerala constitutes almost one-fourth of the country's marine fish production. The significance of fishing industry in Kerala can be identified in terms of production, employment generation, contribution to exchequer by means of export and as a cheap source of animal protein.

3.4.1.1 Fishing Industry in Kerala - General Structure

The fisheries sector of Kerala constitutes both Inland sector and Marine sector. Among these the marine fisheries sector constitutes 2 major sectors such as traditional sector and mechanised or modern sector. Both these sectors with ancillary industries provide ample employment and foreign exchange to the state. The total fishermen population in Kerala for the year 2002-2003 is 10.85 lakhs comprising of 8,35,819 marine fishermen and 2,49,105 inland fishermen. The state has 335 fishermen villages and 2703 fish markets. Among the 14 districts, nine districts are

considered to be marine districts. The district wise distribution of length of coast line, number of fishing villages and fisherfolk population during the year 2002-2003 is shown in table 3.18.

Table 3.18

District wise Structure of Fishing Industry in Kerala

Sl.No.	District	No. of fishing Village		Length of coast line (Kms)	Fisherfolk population	
		Marine	Inland		Marine	Inland
1	Thiruvananthapuram	42	4	78	175854	1417
2.	Kollam	27	26	37	98970	36002
3.	Pathanamthitta	-	3	-	-	2439
4.	Alappuzha	30	24	82	117468	65440
5.	Kottayam	-	8	-	-	26206
6.	Idukki	-	1	-	-	819
7.	Ernakulam	21	15	46	76468	67638
8.	Thrissur	18	8	54	73575	20922
9.	Palakkad	-	2	-	-	2742
10.	Malappuram	23	6	70	84385	4603
11.	Kozhikode	34	8	71	104141	12717
12.	Wayanad	-	1	-	-	285
13.	Kannur	11	5	82	58822	6875
14.	Kasargode	16	2	70	46136	1000
	Total	222	113	590	835819	249105

Source : Compiled from 'Kerala fisheries at a glance-2004', Department of Fisheries, Govt. of Kerala.

3.4.1.2 Fish Production

The state wise marine fish landings and their percentage to Indian landings was already shown in table 3.10. The fish production in Kerala during the last six years is shown in table 3.19.

Table 3.19

Fish Production in Kerala During 1998-99 to 2003-04

In lakh tones

Year	Marine	Inland	Total
1998-99	5.82(89.81)	0.66(10.19)	6.48 (100)
1999-00	5.94 (88.92)	0.74(11.08)	6.68(100)
2000-01	5.67(86.96)	0.85 (13.04)	6.52(100)
2001-02	5.94(88.39)	0.78 (11.61)	6.72(100)
2002-03	6.03(88.94)	0.75(11.06)	6.78(100)
2003-04	6.08(88.50)	0.79(11.50)	6.87(100)
Mean growth rate	104.46	119.70	106.02

Source: Economic Review 2004, Planning Commission, Govt. of Kerala p.99.

During the year 2001-02 the total marine fish production of the state accounted for 5.94 lakh tones, this increased to 6.03 lakh tones in 2002-03 and in 2003-04 it further increased to 6.08 lakh tones. From the above statistics it is clear that the marine sector constitute a major share in this industry.

3.4.1.3 Fishing Industry - A Source of Revenue

Kerala has a unique place in the map of maritime states of India in the case of marine fish production and exports. The contribution of Kerala to the country's total marine landing is around 25 percent. Kerala reached a record production of 6.5 lakh tonnes consistently during 1989 and 1990. Nowadays about 75% of Maximum Sustainable Yield (MSY) of pelagic fishes and about 55% of MSY of demersal species are being exploited in the 200 meter depth zone of Kerala coast. At the same time the inland sector contributes 2% of the country's total inland fish production. The potential fishery resource of the state from marine sector alone is estimated as 5, 117, 217 Mts, i.e., 23.41% of the Indian potential. The state accounts for around one fifth of the marine products exported from the country. Of the Rs. 6,340 crore of foreign exchange

earned by the sea food industry during 2000-2001, Rs. 1,100 crore was contributed by Kerala. In 1991 - 1992 the export of marine product from India was worth Rs. 1,375.87 crores, and the share of Kerala was 32.3% amounting to Rs. 444.16 crore. Table 3.20 narrates the marine products export from Kerala vis-à-vis India.

Table 3.20

Export of Marine Products from Kerala Vis-a-vis India

Year	India		Kerala		% share to total	
	Q	V	Q	V	Q	V
1998-99	302934	4627	70641	817	23	18
1999-00	343031	5117	92148	1148	27	22
2000-01	440473	6444	88852	1046	20	16
2001-02	424470	5957	72756	951	17	16
2002-03	467297	6881	81393	1046	17	15
2003-04	412017	6881	76627	1099	19	15
Mean	398370	5985	80403	1018	20	17

Source: Economic Review 2004, Planning commission, Govt. of Kerala. P.103.

The total marine products export from India in the year 2001-02 amounts to Rs.5957 crores (424470 MT) it turned to Rs.6881 crores (467297 MT) in the year 2002-03. A slight decrease in quantity of export was observed in 2003-04 and the quantity exported was only 412017 MT whereas the value realized from export of the same was Rs.6881 crore. Kerala's share of exports is 72756 MT in 2001-02 for Rs.951 crore and 81393 MT in 2002-03 for Rs.1046 crore and 76627 MT in 2003-04 for Rs.1099 crore.

The importance of marine fishing industry in Kerala is self explanatory with regard to its exports. As a contributor of around 20% of the country's export, it is interesting to see the market wise export of marine products from Kerala as shown by Table 3.21

Table 3.21

Market wise Export of Marine Products from Kerala

Q-Quantity in 000 tonnes V. value-Million US$

Sl. No	Item	2001-02		2002-03		2003-04	
		Quantity	% to total	Value	% to total	Quantity	% to total
1	Japan	8999	12.29	1782	14.34	9008	11.76
2	USA	10435	14.34	1613	1.98	2058	2.69
3	European Union	32239	44.31	40271	49.51	38144	49.78
4	China	5550	7.63	6347	7.80	6045	7.89
5	S.E. Asia	8774	12.06	6147	7.56	4894	6.38
6	Middle East	2100	3.01	2703	3.32	3655	4.77
7	Others	4629	6.36	5796	7.08	9.25	12.08
	Total	**72756**	**100**	**95035**	**100**	**76627**	**100**

Source: Economic Review 2004, Planning Commission, Govt. of Kerala, P.308

The major markets for Kerala marine products are European Union countries, the USA, Japan and South East Asia. In the year 2001-02 the European Union countries alone contributed 44.31% of Kerala export in terms of quantity and 42.37% based on value of export. These figures are 46.51% and 48.35% in 2002-03 and 49.78% and 47.81% in 2003-04. The demand for Kerala marine products are more in European Union countries, USA and Japan as we have observed in Table 3.21. The item-wise export of marine products from Kerala is shown in Table 3.22.

From the figures, it is clear that the most preferred marine product from Kerala is the frozen shrimp. In the finance year 2001-02, 38% of total exports based on quantity were frozen shrimps and its value realization was 57.81% of the total exports. The same situation prevailed in other

years too. In 2002-03, 33.78% of quantity and 51.94% of value was from shrimp. In the year 2003-04, the figures are 38.10% and 54.35% respectively. Other major items of export are frozen cuttle fish, frozen squid etc.

Table 3.22

Item-wise Export of Marine Products from Kerala

Q-Quantity in 000 tonnes V. value-Million US$

Sl. No	Item	2000-01		2001-02		2002-03		2003-04	
		Quantity	% to total	Value	% to total	Quantity	% to total	Value	% to total
1	Frozen shrimp	28023	38.53	27496	57.81	29198	38.10	29198	61.94
2	Frozen fish	11951	15.60	16387	6.13	13976	18.22	13976	4.56
3	Frozen cuttlefish	13619	18.59	5743	6.13	16543	21.57	16543	5.25
4	Dried items	95	0.13	42	0.04	29	0.04	29	0.04
5	Live items	272	0.37	155	0.19	278	0.36	278	0.32
6	Chilled Items	540	0.74	759	0.91	1100	1.43	1100	1.17
7	Others	6338	8.71	5217	5.59	7280	9.50	7280	5.28
	Total	**72936**	**100**	**950.55**	**100**	**81393**	**100**	**1004.52**	**100**

Source : Economic Review 2004, Planning Commission, Govt. of Kerala, P.308

3.4.1.4 Source of Employment Generation

The above figures tell us the importance of Kerala with regard to the country's production and earning of foreign exchange. Moreover, this sector provides the main source of income for about 1.90 lakh active fishermen and almost an equal number in the allied activities of processing and marketing.[46]

The district-wise distribution of active fishermen and fishermen families in Kerala during 2002-03 and 2003-04 is depicted in table 3.23. In addition to these approximately three quarters of animal protein in take of the states population is derived from the fish.

Table 3.23

District wise Distribution and Percentage of Active Fishermen in Kerala from Marine Population

Sl.No.	Name of District	2002-03			2003-04		
		Population (Estimated)	No. of active fishermen	% of active fishermen	Population (Estimated)	No. of active fishermen	% of active fishermen
1.	Thiruvananthapuram	175854	46446	26.41	177488	45384	25.57
2.	Kollam	98971	19697	19.90	99891	18428	18.45
3.	Alappuzha	117466	30772	26.20	118558	29808	25.14
4.	Ernakulam	76468	13453	17.59	77177	14205	18.41
5.	Thrissur	73577	8635	11.74	74261	8247	11.11
6.	Malappuram	84385	22993	27.25	85170	24901	29.24
7.	Kozhikode	104140	19132	18.37	105108	21313	20.28
8.	Kannur	58822	5830	9.91	59369	7049	11.87
9.	Kasargode	46136	9792	21.22	46565	10034	21.55
Total		835819	176750	21.15	843587	179369	21.26

Source : Kerala Fisheries at a glance -2004, Department of Fisheries, Government of Kerala.

The importance of fishing industry can be explained in terms of production, employment generation, contribution to exchequer by means of exports and as a cheap source of animal protein. Kerala has a unique place in the map of maritime states of India in the case of marine fish production. The contribution of Kerala to the country's total marine

landing at present is almost 25%. Presently about 75% of Maximum Sustainable Yield(MSY) of pelagic fishes and about 55% of MSY of Demersal species are being exploited in the 200 meter depth zone of Kerala coast.[47]

At present the marine fisheries sector comprise of two sectors such as traditional and modern. Both these sectors with ancillary industries provide employment to nearly 5% of the work force in the state.[48] The total fishermen population as per Table 3.20 during 2003-04 was 1095108. Among them there are 843587 who belong to marine sector and 251521 to the inland sector. The figures reveal the importance with regard to employment generation.

For the development of marine fishing industry, the development of infrastructure is an inevitable factor. The major facility needed for the same are fish harbours; Neendakara, Munambam, Puthiyappa, Chombal, Moplabay, Tangasserry and Kayamkulam are the leading harbours followed by Vizhingam, Muthalapozhy, Ponnani and Thottapalli in progress.

For having a clear insight in to the changes that took place in the fishing sector, an attempt is made to present the mechanization process in the next chapter.

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CHAPTER IV

MECHANISATION OF FISHING INDUSTRY

Interest in the socio-economic problems of the fisheries sector began in a big way since 1950s. The immediate cause for such an awakening of interest appears to have been the introduction of mechanised fishing and the consequences followed thereon.

4.1 Indo-Norwegian Project & Mechanisation Process

In Kerala Mechanised fishing was introduced in 1953, at Neendakara-Sakthikulangara region under the initiative of Indo-Norwegian Project (INP). The Norwegian Government's technical economic aid project was started in 1953 in two fishing villages – Sakthikulangara and Neendakara –six miles north of the town of Kollam in Kerala. The signing of the agreement between United Nations, the Government of Norway and the Government of India concerning the economic development, on 17th October 1952 laid the foundation for the implementation of the project at Neendakara.[1] This resulted in the beginning of Integrated Fisheries Project.

In the Norwegian project area, fishing was the chief occupation, and so fishing began to replace agriculture as in the objective originally formulated for INP. The first agreement between Norway and India (with UN as a kind of sleeping partner) stated that the project is to aim at:

(a) increase in the returns of fishermen's activity;
(b) efficient distribution of fresh fish and improvement of fish products;
(c) improvement of health and sanitary condition of fishing population; and
(d) in general, a higher standard of living for the community of the project area.[2]

The measures undertaken under the programme comprised of the mechanisation of fishing crafts, use of improved fishing gears, training of fishermen, improved fish handling, preservation and distribution of

fish and improvement in the living conditions of fishermen. The initial attempt at mechanisation was the motorisation of indigenous crafts; after sometime this attempt was abandoned, project workers tried to construct a new type of vessel which could fish from areas close to the beach, and for several years these experiments were carried on. However, the idea of mechanising the beach – fishing was abandoned, and the next initiative was in constructing a boat-type which was dependent on small natural harbours.

The novel facilities introduced in fishing industry by Indo-Norwegian Project (INP) accordingly are: mechanically operated new boats, new fishing nets, and the Norwegian model ice factory with a cold storage plant, INP has introduced new methods of fish processing and forms of distribution. Capital for this has been available to the fishermen in various forms of subsidies and loans.[3] Every fisherman who had been allotted a motor boat has went through a training of six months.

As stated earlier the history of Integrated fisheries project datesback to October 17th, 1952 when the government of Norway, India and United Nations signed a tripartite agreement. It was agreed that the government of Norway would assist the Government of India in carrying out a programme of developmental projects to contribute to the furtherance of the economic and social welfare of the people of India. The Supplementary Agreement signed on 24th January, 1953 gave shape to Indo Norwegian Project for fisheries and fishermen community development in Neendakara. The activities of the Indo-Norwegian Project at Neendakara were subsequently extended to Cochin with the establishment of a fishing centre in 1957 under the Second Supplementary Agreement signed on 21st April 1956.[4] The project continued to be administered by the State Government under the supervision of the Government of India. This was done in consultation with the Norwegian representatives till 1st April 1963. With the extension of the activities of the project to the neighbouring states of

Tamil Nadu and Karnataka, the Government of India took over the administration of the project. The headquarters was shifted from Neendakara to Eranakulam, as conceived in the Third Supplementary Agreement, which was signed on 27th November 1961.[5]

Fulfilling the main objectives, in 1963 the INP Neendakara was handed over to the Government of Kerala along with its different units, such as health centre, ice plant, cold store, boat building yard, workshop and premo pipe factory. In 1993 – 94 the project established new centres at Cannanore in Kerala State, Karwar in Karnataka and Mandapam in Tamil Nadu. In addition the activities at Ernakulam were expanded by acquiring a fleet of modern fishing trawlers and research vessels.

The project acquired new dimensions with the construction of a modern marine workshop and slipway capable of handling under water repairs to fishing trawlers up to 250 tonnes displacement - the first of its kind in the fishing industry of the country and a fish processing cum training centre at Ernakulam. Assistance was also rendered to the construction of a fishing harbour at Cannanore. Under a new agreement signed between the Government of India and Norway in 1967, the activities of the Project expanded to new vistas covering offshore and deep-sea exploratory fishing, practical training and demonstration of modern technology on land and at sea. On completion of agreement with the Government of Norway in 1972 the administration of the project at Cochin was completely taken over by Government of India and Indo-Norwegian Project was renamed as Integrated Fisheries Project.[6] However, non-project aid from Norway in the form of equipment and expertise continued and integrated fisheries project functioned as the central agency for the import of Norwegian aid materials and for distribution among other fisheries organisations. The establishments of the project at Cannanore, Karwar and Mandapam were handed over to the respective State Fisheries Departments. From 1st April 1972 onwards, Government of India administers the project and the project

continued its programmes as a central sector scheme under the ministry of agriculture.

The fishermen were exposed to new fishing techniques and various techno economic stimuli presented by the Indo-Norwegian Project (INP). The INP introduced new and more effective production equipments, new boats and better nets. In the beginning, there were, of course, difficulties but in due course, fishermen managed to keep the mechanised means of fishing as an essential change of the fishing method along with the introduction of the modern nylon net used for drift net fishing in the night. In 1957, the INP started the Mechanisation Programme (MP) by introducing three medium sized boats with 20 BHP engines fitted with mechanised winch, eco sounders, and wireless telephones. Later the state fisheries department was aided by FAO for providing craft & gear and other needy equipments for storage and transportation. The department also introduced boat building yards.[7] Simultaneously the private sector with non-fishermen made inroads into the fishing industry. The number and size of boats increased with most modern equipment. The private sector had started exporting shrimps and other important varieties of fish. Meantime no fishermen owned a single ice plant, export unit etc. So with this tilt in balance, the minority of actual fishermen with meager number of boats were not in a position to compete. Introduction of large number of mechanised boats (mostly trawlers) by INP-1957 through the state government resulted in the entry of non-fishermen and middlemen into the industry and their activities resulted in the over exploitation of natural resources and marginalisation of traditional fishermen.

Even before the formation of Kerala State, both the Travancore and Cochin State administrations had shown some interest in developing the fisheries sector. The developments – were mainly through the Madras fisheries department and the fish curing yards in Malabar.[8] But a planned development of the fishing sector came through the INP as

cited above. The aim of the INP was the introduction of mechanised boats and a new approach to fishing and fish marketing. As an initial phase motorisation of traditional crafts was undertaken, but this proved to be a failure.[9] Then the INP development programs undertook the modernisation of small boats with in-board motors. Initially they distributed 88 boats in Kerala in the year 1962. The department of fisheries had distributed another 25, with 14 held back for training.[10] Development plans envisaged an increase in productivity and employment; the National Council of Applied Economic Research's Techno-Economic Survey for Kerala in the early 1960s gave a picture of a fishing industry moving towards an almost complete shift to a 'modern' sector.

Modernisation paved the way for new forms of gears like nylon nets and also started using new forms of processing. In the past, drying and curing had been the methods used but freezing became increasingly important because it was the basis of export trade in frozen prawns as commodity for US and Japanese markets.[11] Modernisation brought about exploitation of the most wanted item in foreign market, which is prawns. The prawn catch, and the take overall, reached new heights in 1973; thereafter there was a decline-(a matter of great concern to inshore, artisanal fishermen)-although there was still considerable profit in the export-oriented sectors.[12]

The change in fish production developed new mechanised boats and trawlers. These trawlers and boats became the property of non-traditional fishermen because the capital investment for boats and gears, and their maintenance, was well beyond the reach of most artisanal fishers. Those who had access to capital from fish trading or broking, or who were linked to other capital resources became owners and stood to reap the profits of the new enterprises.[13] The fishing industry became increasingly polarised between a 'modern' (mechanised) sector, able to make considerable profits from exports and a 'traditional' (non-

mechanised) sector confined to a domestic market with declining catches and fish stock. In the 1980s the increasing industrialisation and internationalization of the fisheries by mechanisation and trawling by still larger vessels, of Indian companies and trawlers of other nations (the Japanese, the Thais and the Taiwanese were all active), heightened this polarisation and posed dangers which threatened both the fisheries and the artisanal fishers.[14]

4.2 Vessels in Operation Before Mechanisation

Till the advent of mechanisation of the fishing crafts man living on the shores of oceans and banks of estuaries was nourished by the fish that could be captured by using whatever craft he could use. Except for mechanised vessels introduced recently, fishing crafts in most countries were usually indigenous, non-mechanised and locally built. They were designed to suit the local conditions and populations captured. The different kinds of fishing crafts used by traditional fishermen were catamaran, dug-out canoes, plank-built canoes, masula boats, dhinghi, out-trigger canoes, built up boats etc.[15]

Catamaran – The simplest type of fishing craft may be termed as the one formed by a few curved logs of wood joined together forming a kind of floating raft, such as the ones used along the east coast of India.

Dug – out Canoes – A simple type of fishing craft for fishing within short distances from the coast. It is a small-sized canoe made by scooping logs of wood in the form of a boat. The 'odams', 'thonies', 'vanchies' etc. of the south coast and south west coasts of India are included in this category.

Plank – built Canoes – This is an enlarged variety of dugout canoe made of planks on the sides, largely used in localities such as Kerala.

Masula boats – It is made of non rigid planks tied together with coir ropes as the ones used along Andhra coast.

Dhingi – This is a carvel type of boat designed and constructed for a variety of purposes including fishing.

Out trigger Canoes – Sometimes plank – built canoes may be provided with a single outrigger as in the "rampani" boats used for capturing mackerel in Karnataka.

Built – up boats – Like most of the boats made at present, the carvel type boats are built of planks. The best type of built up boats are seen in centres along the north-east coast of India.

The major traditional and common fishing gears are traps, castnet, simple gill/drift net, hooks, long line system of hooks etc. A survey of the traditional fishing crafts of the country revealed the existence of 17 principal types of fishing crafts which were indigenously evolved on the basis of their suitability of operation in the respective local condition.

A census of artisanal marine fishing fleet of Kerala was conducted by SIFFS in 1991. It estimated that there were about 15,090 Catamarans, 3734 dugouts and 1680 plank built canoes in the non-motorised sector (total of about 20545). By 1997-98, number of non-motorised crafts had increased by 1053, and the total number of crafts operating in Kerala coast during 97-98 was 22,271. But in 1998-99 the number of non-motorised crafts decreased by 673 when compared to previous year. The total number of traditional non-motorised crafts in Kerala during 1998-99 was 21,598.[16] There was enormous increase in the number of fishing crafts operating in Kerala during the last decade. The total number of mechanised and non-mechanised crafts have increased from 34007 in 88-89 to 55501 in 2003-04. The increase was mainly in the case of motorised crafts which rose from 9914 to 29395.[17] However the number of non-motorised vessels show a decline in number.

Rampant motorisation of traditional crafts, increase in number of traditional motorised crafts and operation of mechanised boats in inshore area etc. made the situation of traditional crafts worse on

account of non-availability of fish. Fishing in the territorial waters and beyond has always been the major source of livelihood for fishermen all along the coast. Till the early seventies fishing was confined to traditional types of vessels. There is no doubt regarding the enhancement of marine fish production due to mechanisation and motorisation. But the mechanised boats scrapped the bottom of the sea for fish. This led to the gradual decrease in fish landings and made life difficult to traditional fishermen. Inspite of this the household income of the traditional fishermen had showed an increase of Rs.9000/- per annum. While that of the motorised and mechanised were Rs.32,000/- and Rs.92,000/- respectively during 2000-2001.[18]

4.3 Motorisation in the Traditional Sector

The success of exploitation of the fishery resources depends to a very large extent on the nature and size of the craft and gear system and the efficiency of utilization of the system. As the craft and gear system play a pivotal role in the exploitation of the known fishery resources, efforts have been made for a planned development of this system since the beginning. This involved measures to improve the operational efficiency of the existing crafts, like motorising traditional boats and introducing new vessels of different types, to exploit the varied resources of different areas.

The development of the craft system in India has had four phases, viz.,

i. country craft motorisation
ii. introduction of small mechanised boats,
iii. introduction of more specialized boats and
iv. broadening into fishing fleets.[19]

As a result of these developments, the fishing industry in India now consists of three distinct sub-sectors in the craft and gear system. These sub-sectors are:

1) Traditional sector with non-mechanised crafts and gears,
2) Modern sector consisting of small mechanised boats.
3) Ultra modern sector consisting of large vessels designed to operate in high seas beyond the areas of operations of traditional and small mechanised craft.[20]

During the first plan, a thorough examination of the various designs of traditional crafts was carried out and it was found that only a few designs of traditional crafts were suitable for mechanisation. Simultaneously, attempts were made to see whether the boats which were suitable for taking inboard engine could be fitted with out board motors. By and large, the boats were found to be unsuitable for motorisation due to high stern. In some boats, however, the outboard motor could be mounted on a special bracket fixed for the purpose.

In the post 1980s, several developing countries like India began to experience a new wave of globalization. The new era of globalization brought new forms of 'appropriate technology' to assist small-scale fish harvesting. The most important among these were the outboard motors (OBM), beach landing crafts and fishing nets made of new materials. Adoption of OBM's on small scale fishing boats was rapid. Its contribution towards reducing the drudgery of labour in small scale fishing was considerable. Use of the OBM also led to a comparative advantage as regards the speed with which one could reach the fishing grounds and return early in order to get a higher price. By this time, in some countries, use of OBM, led to the total displacement of the use of sails and oars. Fishermen had got "locked in" on OBM and 'de-skilled' in relation to the use of renewable energy technologies perfected over the centuries.[21]

Large scale motorisation of country crafts in Kerala began in the early eighties, eventhough experimental projects were tried much earlier. The successful trials carried out at the fishing village of Kannamali

(Ernakulam district) during 1979-80, attracted the fishermen of this region. Soon motorisation programme picked momentum in Kerala and fishermen of Alappuzha, Ernakulam and Kollam districts were credited for the initiative and large scale adoption. From about 50 outboard engines during 1979-80, the number had gone up to 10,000 by 1989.[22] According to SIFFS there were about 3270 plank canoes, 4752 dugout canoes and 1878 plywood canoes in the motorised sector during 1991. The total number of motorised crafts had increased from 22,723 in 97-98 to 27094 in 1998-99.[23] The largest increase was reported in country crafts, when compared to non-motorised and mechanised crafts, which is a very unhealthy trend. This trend was reversed very quickly and the motorised crafts in Kerala rose from 9914 in 88-89 to 29395 in 2003-04.

Along with this process of motorisation that added automatic propulsion, the traditional sector also underwent changes. The major change in this sector was the 'ring seinisation' of the traditional encircling method of fishing. This started during the third quarter of 1986. Ring-seine is a mini purse- seine. The ring-seine replaced the traditional gears of 'Kollivala' and 'Thanguvala'. 'Mini-trawling' is another post motorisation innovation. It started in Kerala, in 1987. Besides these changes in crafts and gears, there were also innovations in the materials used. In southern Kerala, the canoes built of plywood was successfully introduced and now it is widespread. Besides, artificial reefs like the Fish Aggregating Device (FAD) and Fish Attracting Lanterns (FAL), have been successfully experimented by the local fishermen in Kerala. Eventhough the household income of traditional fishermen in motorised sector showed an increase of Rs.32,000/-, motorisation lead to problems; it even de-skilled the skilled fishermen of Kerala. The need for capital investments and maintenance of OBM's really put a burden upon traditional fishing communities. OBM's needed to be replaced in every two years. Many were not able to set aside sufficient funds from their earnings in order to make new investments.

Hike in fuel prices, fall in prices of catches, over exploitation of sea and non-availability of fish etc. are the major problems of this particular sector.

4.4 Mechanisation Process Under Five Year Plans

Prior to the first five-year plan very little attention had been given to the development of fisheries in the country.[24] In the case of marine fisheries, the first five-year plan identified the priorities of its development as:

a) mechanisation of country craft or introduction of new mechanised boats
b) harbour facilities
c) supply of requisites to fishermen
d) development of marketing
e) provision of ice and cold storage and transport facilities
f) introduction of mothership operations and
g) provision for off-shore fishing with larger powered vessels such as purse-seiners and trawlers.

Based on these priorities the Plan provides for a total expenditure of Rs. 4.6 crores in addition to the provision under the Technical Co-operation Aid Programme. They estimated that the programme would rise production from one million tons then to five million tons at the end of the plan.[25]

The government of Kerala also devised more or less the same strategies for development of the fishing sector. The first five year plan of Travancore - Cochin state was of no significance to the fisheries development in Kerala. The investment made by the state in fisheries was a paltry sum of Rs.0.27 million.[26]

Progress in the fisheries field received an impetus both from the initiative of the Central and State Government and from the technical and other assistance received under the Indo-U.S. technical co-operation

programme, the Indo-Norwegian fisheries community development programme and from the Food and Agricultural Organisation (FAO). As against a provision of Rs.5 crores in the first five year plan, the second plan envisaged a total outlay of about Rs.12 crores - About 4 crores on the part of the Ministry of Food and Agriculture and about Rs.8 crores in the plans of state.[27] In the development of sea fisheries, the tasks undertaken under second five year plan falls broadly under four categories:

1. improvement of fishing methods,
2. development of deep sea fishing,
3. the provision of fishing harbours, and
4. the organisation of fish transport, storage, marketing and utilization of fish.[28]

The plan identified that, in order to increase production in offshore waters, mechanisation of fishing craft and improved fishing methods are essential.

The Second Five Year Plan observed that the technique and implements used by fishermen in Kerala continued to be traditional,[29] so they planned to mechanise the small fishing crafts. As part of this programme, fixing of engines in local fishing crafts were planned and executed with the help of INP at Neendakara and private boat building yards at Cochin and Palluruthy. Two new boat building yards were proposed for Vizhinjam and Beypure. The total cost of this scheme was 8.36 lakhs.[30]

During the plan period 45 mechanised boats (25 feet in length fitted with 10 HP engine) and a larger mechanised boat (30feet with 30 HP engine) were constructed and issued to fishermen. The government established fishermen training centres at Cochin and Beypure.[31]

The review of first two plans showed that the production of fish increased from seven lakh tones by the end of the first plan to 14 lakh

tonns by the end of the Second Plan.[32] Fisheries schemes in the third Plan have been formulated with the main objective of increasing production. Due consideration has been given towards effecting improvement in the condition of fishermen. Emphasis has also been placed on the development of export trade. The third five year plan envisioned a much higher tempo of development.

As a result of the programmes that were being taken up during the third plan period; the production of fish was expected to increase from 14 lakh tones to 18 lakh tones. Export of fish went up from about Rs.6 crores to about Rs. 12 crores. About Rs. 29 crores had been allotted for the development of fisheries in the third plan.[33]

During the plan period the following specific programmes were adopted in the Marine fisheries of Kerala:

1. mechanisation of fishing crafts
2. commercial trawler fishing
3. issue of modern equipment
4. fishing harbours and landing centres
5. ice plants, cold storage and transport vehicles
6. training to fishermen
7. setting up freezing, canning, fishmeal, fish manure, fish curing establishments, and
8. welfare schemes like organisation of fishermen co-operative societies etc.[34]

To promote mechanisation it was decided to put up two more boat building yards at Azhikode and Cannanore. The total provision for fishing development was Rs. 450 lakhs, but the actual expenditure was only Rs.334.01 lakhs (75%).[35]

In the third plan and in the succeeding Annual Plans, the main objectives of the fisheries programme were on increasing the production and development of export potential in fish and fish products. There has

been perceptible progress in attaining these objectives. There had been considerable progress with mechanisation, and in the construction of major fishing harbours.[36] So in the Fourth Plan, fisheries development had three main objectives namely:

1. increase in fish production to meet protein requirements
2. development of export potential, and
3. improvement in the economy of fishermen.

Keeping in view the various constraints, the target for production in the final year of the fourth plan had been fixed at 1.97 million tones as against a base level of 1.50 million tones in 1968-69.[37]

Meanwhile the Government of Kerala had prepared a "master plan" for fishing development at a cost of Rs 306 crores for a period of 20 years to commence in 1969. The master plan envisaged increasing the fleet of mechanised boat to 8100 and trawlers to 555. This huge proposal was prepared on the basis of the report of the working group on the fisheries of the fourth five year plan, which estimated that the potential catch of Kerala was 17.87 lakh tones.[38] In consonance with the master plan the approach in the fourth five year plan was to intensify the fishing efforts in the exploitation of off-shore regions.[39] Further the fourth plan tried to implement integrated fisheries projects at Vizhinjam, Neendakara, Cochin, Azhikode, Ponnani, Beypure, Thalai, Moploa Bay and Balipatam after the model of INP at Neendakara.[40] The schemes in the integrated fisheries project composed of: mechanised fishing, trawler fishing, boat yards and service stations, ice plants and cold storages, training centres, roads, and distribution of fish.[41] The development during the fourth plan period, helped to stabilize the tempo of mechanisation.

The major emphasis on Fifth Five Year plan also targeted the mechanisation of boats, production of fish seed and development of fishing harbours. In Kerala, the spirit of the master plan was not carried

forward in the fifth five year plan. The fifth plan therefore introduced a different policy and approach aimed at diversified fishing activities.[42] The fifth plan strategy was to introduce 20 large fishing vessels and 540 mechanised fishing boats in the public sector. Five hundred mechanised boats and 50 deep sea fishing vessels were anticipated in the private sector.[43]

The priority of boat mechanisation programme began to taper off and vanish ultimately. During the sixth plan, the government of Kerala allotted Rs. 100 lakhs solely for the purpose of completing the package schemes at Tanur, Chervathur and Karunagappally and gill net scheme at Vizhinjam.[44]

In the seventh five year plan, the main thrust in the marine sector was on exploitation of Exclusive Economic Zone (EEZ) by introduction of deep sea fishing trawlers, construction of indigenous trawlers and chartering of foreign vessels. The development of fishing ports, terminal marketing facilities and other shore establishments were proposed to be provided/strengthened, to facilitate the operation of fishing vessels. Through these measures it was planned that fish production should reach a level of 4.0 million tones by 1989-90.[45] The focus of mechanisation got changed from prawn trawling vessels operating in the inshore waters to that of deep sea fishing on the one hand and fitting traditional crafts with OBM on the other. Therefore, in the seventh plan, no allotement was made for the programme of mechanisation.

By the end of the seventh plan, the fish production rose to 36.77 lakh tones, 22.75 lakh tones from marine and 14.02 lakh from inland sector.[46] In July, 1988, the government of India decided to create a separate Ministry of Food Processing Industries (MFPI) to deal with areas like:

i. Fishing and fisheries beyond the territorial waters including deep sea fishing station now called Fisheries Survey of India(Bombay),
ii. Processing of fish,

iii. Technical assistance and advice to fish processing industry,
iv. Establishment and servicing of development council for fish processing industry,

In January 1989, a National Fisheries Advisory Board (NFAB) was set up with the objective of rendering advice in respect of fisheries and orderly development of fishing industry, export of marine product etc. Ultimately the thrust area changed from mechanisation process to welfare of fishermen and fish exports by the eighth plan. The total fish production has increased from 41.57 lakh tones in 1991-92 to 53.50 lakh tones in 1996-97, registering an annual growth rate of about 5% during eighth plan. There had been a significant increase in the export of marine products both in quantity and value terms. During the Nineth Five Year plan this has increased from 1.39 lakh tones (valued at Rs. 893 crore) in 1991-92 to 3.78 lakh tones (Rs.4121 crore) 1996-97.[47] The nineth plan too has not emphasized on the mechanisation programme. Thus, the period ranging from the second to sixth plans make up the epoch of mechanisation of fish crafts assisted by the government of Kerala.

4.5 Mechanisation Process and Changes in Fishing Field

Fisheries in Kerala underwent a series of technological changes in last decades. The mechanisation process in the forms of trawlers and purseiners in the 1960s and 1970s polarized the fishermen into traditional and mechanised. The period of 1963 to 1979 signified the emergence of primarily indigenous research and development. This period marked the development of medium and large fishing vessels, research on alternative material for boat building, new and efficient designs of fishing gears and new methods of fishing. During early sixties, there were about 150 mechanised boats in Kerala. In the mid sixties a standardization programme was initiated. Thus, the design of 30 and 32 footer trawlers were accepted as standard ones. It mainly

focused on shrimp trawling. Commercial purse seining started in the state by the end of 1979 with a small fleet of 20 purse seiners. By 1980, the number rose to 70.

After the implementation of INP at Sakthikulangara – Neendakara region of Kollam district, the government introduced a scheme by which mechanised boats were issued to local fishermen at subsidized rates. Fishermen were also given training in operating these boats. During its operation till 1963, at Neendakara the INP in collaboration with government had given training to nearly 167 fishermen and issued 198 mechanised boats of various sizes to groups of fishermen.[48] Later the INP with initiative of the government extended its territory to Cochin, currently the headquarters and base for conducting deep – sea fishing and research, and other areas located at Canannore.

The success of INP prompted the government of Kerala to have a planned approach to the development of fisheries along scientific lines. Realising that fishing industry could play a significant role in national development, plans were chartered out for developing schemes to increase production in several ways like improved methods of fishing, provision for adequate training etc.

In the mechanised sector the size of mechanised boats vary from 28 feet to 50 feet. The standard size is 35 feet – usually built with wood and steel. They are normally operated for eight to nine months with five to six workers. The mechanised sector provides ancillary employment to several other industries related to the fishing industry. Ice-plants, cold storages, processing units, peeling sheds, net shops, spare part shops, diesel pumps etc. greatly depend on the mechanised sector.

4.5.1 Recent Position and Trends

The total number of mechanised and non-mechanised crafts has increased from 49200 in 1997-98 to 52,732 in 1998-99. During this period the number of mechanised vessels showed a declining trend. In

1998-98, there were 4206 mechanised crafts in Kerala, but it reduced to 4040 by 1998-99.[49] After 1999 it again projected a progressive growth. Another notable change is in the size of fishing vessels. From medium type shrimp trawlers of 36 feet fitted with 46 to 50 HP diesel engine, the latest models vary from 42 feet to 57 feet, and even 73 feet. These boats came are propelled with high power engines. Moreover, instead of wood, iron is commonly used for constructing boats. There have been several other changes in the gears too.

The recent trends in fishing practices are the use of fish detection methods and electronic and communication devices. Introduction of acoustic fish detection devices is one of the most significant developments in modern fishing. It has greatly reduced the element of chance and the dependence on fisherman's intuition in fishing. It has enhanced the effectiveness of fishing by reducing the time spent for searching. Important fish detection devices are echo sounder, sonar and net recorder. Among them Echo sounder is the most well known and widely used instrument for fish detection. Echo sounders are used for:-

- recording depth for navigation purposes and fixing, the position,
- ground or sea bed discrimination i.e., to distinguish soft mud, sand, gravel and rock bottom conditions;
- location of wrecks and hazardous areas; and
- location of fish and determination of its depth of occurrence.

Sonar is the acronym for sound navigation and ranging. Earlier it was also known ASDIC (Allied Submarine Detection Investigation Committee). Sonar is an indispensable tool for targeted trawling and purse seining. Another important device is the net recorder. It is also known as net sonde, trawl eye or gear monitoring system. Net recorder is used to obtain information about the net mouth opening, the depth and position of the net, relative to fish, in addition to the nature of sea bottom. In addition to these wireless hand sets are commonly used

nowadays to convey messages between vessels in the sea at the time of its operation. Mobile phones are also used by mechanised fish workers to have connection with owner in the harbour. All these have increased the production capacity of the mechanised fishing sector.

4.5.2 Wage Pattern of Workers in Mechanised Sector

In the mechanised fishing sector the workers are given 35% of the total income of the boat. In addition to these the workers get 'bata'. The bata is given as a lumpsum amount of Rs.350/- to Rs.500/-, from which the workers spent a small amount for daily ration of food and the balance is divided equally among themselves. From the 35% the 'shrank' who is the captain of the boat, gets 9% to 10% share; the 'driver', the machine operator gets 7% to 8% share and 'deck-hands', normally three persons get 5% share each. In addition to this, workers are given bonus when the catch is plentiful.

4.6 A Different Dimension

Kurien and Achari pointed out two clear approaches to modernisation of the fishing sector. The first approach termed as 'slow modernisation' phase-starts from what exists in the traditional fishing economy. The emphasis with regard to technology is to provide a continuous base on what existed, making gradual attempts at raising the capital intensity and changing design. The period 1956 to 66 was considered as the 'slow modernisation phase'. During this period the fisheries sector remained as the primary source of livelihood and food for the local population. The thrust was to raise the levels of productivity of fish harvesting and improve the methods of fish processing by a two-fold approach: Firstly by upgrade the existing traditional technologies and secondly gradual introduction of new innovations. In the first category we include the efforts to supply wood for traditional boats, cotton for nets and setting up of fish curing yards for hygienic processing. In the second, the introduction of nylon nets, supply of small mechanised gill-net boats

and the establishment of more ice plants. The overall emphasis of providing credit and organizing of cooperatives through which new technology could reach the real producers was an important institutional intervention of this phase. During 1956-66 the State spent Rs.41 million on fisheries development, of this about one-third was spent for improvement of technology. The effect of these policies are exhibited by the trends in fish production during this period – and is indicated on the following table.

Table 4.1

Fish catch, Price and Value Output in Kerala State *(Select years)*

Phase	Year	Fish catch (000 tonnes)	Average Price (Rs. per tonne)	Value (Rs.million)
Slow Modernization	1959	193	100	20
	1966	347	275	95
Rapid Modernization	1967	364	290	105
	1975	421	1760	740
	1976	331	1700	565
	1980	280	2970	830
Dilema Phase*	1981*	275	2000	550
	1982	325	2280	740
	1984	393	2400	945

Source : Social Action, Vol. 38, January-March, 1988, P.15.

* The decline in prawn harvest during this phase accounts for the reduction in the value of output and average price when compared to 1980.

During this period fishing and fish related activities of fish processing and marketing continued to be traditional, caste-bound occupations.

The period from 1967 to 1980 was termed as rapid modernisation phase. The compulsions of international market and the efforts of the INP proved to be successful in exploiting coastal prawns and the acute foreign exchange crisis prompted the Government to provide new thrust

for fisheries development. The emphasis was on increasing production and earning foreign exchange by the rapid introduction of new technologies.

In the realm of fish production this meant large scale promotion of trawlers (from 1967 onwards) and purse-seiners (from 1976 onwards). The state alone invested Rs.288 million during the period 1967-80. Of this about 129 million (45%) was for introduction of trawlers and related fisheries infrastructure facilities. The impact of the mechanised sector began to be felt in this period. The labour productivity in this sector – which accounted for 8% of the fishermen-was considerably higher: 5750kg per annum at the 1969-70 level compared to 3340 kg per annum for the fishermen continuing to use traditional technology. Another important feature of this period was the rapid entry of persons not traditionally involved into the fishing sector. During the period 1976-80 new trawlers, and purse-seiners were introduced for the first time.

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CHAPTER V

IMPACT OF MECHANIZATION ON FISH WORKERS

In this chapter an attempt is made to analyze the impact of mechanization of fishing industry on the fish workers. Before proceeding on to the analysis, it is better to define the term 'fishworker' in the study-

The term 'fishworker' is used to denote one who is actively engaged in the fishing operation, particularly in the marine fishing sector. Usually known by the term 'active fishermen'. The active fishermen are those who are engaged in fishing operation, not in fish vending and allied activities. The active fishermen in Kerala are of two types, viz; inland fishermen and marine fishermen. Inland fishermen are those who operate in rivers, lakes or other backwaters of Kerala, while marine fishermen are those who operate in sea for fishing. The present study concentrates on the marine fishing industry and accordingly the term 'fish worker' here means active fisherman engaged in marine fishing operation.

Determinants of Sample Frame of Fish Workers

The fish workers and owners of the crafts spread over all the 14 districts of Kerala form the universe of the study. But among the 14 districts, 5 districts such as Pathanamthitta, Kottayam, Idukki, Palakkad and Wayanad are not engaged in marine fishing operation. Therefore the actual population spread over the nine coastal districts in Kerala forms the marine fish workers in Kerala. The fishermen population in Kerala during 2004-05 is given in table 5.1.

With regard to the marine fishermen population, the districts Thiruvananthapuram, Alapuzha, Kozhikkode, Kollam, Malappuram, Thrissur and Ernakulam are the leading centers followed by Kannur and Kasaragode.

It is important to note that, there is no categorization among the marine fish workers based on type of operation, like traditional fishermen and mechanised fishermen. Eventhough there are several marked conflicts

between these two classes of marine fishermen in Kerala, and a lot of studies were undertaken by several organizations regarding the marginalisation of traditional fisher folk due to the invasion of mechanization, the Government does not demark the marine fishermen into traditional and mechanised fishermen. On the contrary, such a division is present with respect to the fishing crafts in the statistics published by the department of fisheries. The crafts that operate in the marine fishing sector of Kerala is presented in table 5.2.

Table. 5.1

District wise Distribution of Fishermen Population in Kerala (04-05)

Sl. No.	District	Marine				Inland				Marine & Inland Total
		Male	Female	Children	Total	Male	Female	Children	Total	
1	2	3	4	5	6	7	8	9	10	11
1	Thiruvanathapuram	66406	52671	52162	177239	457	530	452	1439	178678
2	Kollam	41301	34930	20472	96703	14401	13557	8695	36653	133356
3	Alappuzha	45934	41929	28409	116272	26715	25603	13733	66091	182363
4	Pathanamthitta	0	0	0	0	1075	934	435	2444	2444
5	Kottayam	0	0	0	0	10443	9913	6177	26533	26533
6	Idukki	0	0	0	0	316	319	200	835	835
7	Ernakulam	30519	28610	17864	76993	25355	24797	17909	68061	145054
8	Thrissur	30177	30405	17310	77892	8481	7755	4889	21125	99017
9	Palakkad	0	0	0	0	925	909	934	2768	2768
10	Malappuram	33136	26944	24627	84707	1963	1710	925	4598	89305
11	Wayanad	0	0	0	0	93	100	96	289	289
12	Kozhikode	40576	35394	27102	103072	4431	4668	3630	12729	115801
13	Kannur	21913	19913	17020	58846	2633	2784	1496	6913	65759
14	Kasaragod	18193	17177	10619	45989	421	398	185	1004	46993
	State	328155	293973	215585	837713	97709	93977	59756	251482	1089195

Source : Economic Review 2005, State Planning Board, Government of Kerala, Thiruvananthapuram, 2006

Table. 5. 2

Distribution of Crafts in Operation in the Marine Sector

		No. of crafts in 2003-2004			
Sl. No.	Name of District	Mechanised	Motorised	Non-Motorised	Total
1	Thiruvananthapuram	102	2559	1878	4539
2	Kollam	374	597	1905	2876
3	Alappuzha	431	2028	3366	5825
4	Ernakulam	253	960	3901	5114
5	Thrissur	107	1530	1145	2782
6	Malappuram	616	1225	619	2460
7	Kozhikode	178	483	452	1113
8	Kannur	117	379	247	743
9	Kasargode	60	449	508	1017
	Total	2238	10210	14021	26469

Source: Marine Fishereies Statistics of Kerala 2005, Department of Fisheries, Government of Kerala, Thiruvananthapuram.

As seen above a division can be made with respect to mechanised, traditional motorized and traditional non-motorized. Accordingly the number of crafts in accordance with the characters like mechanised, motorized and non- motorized form the marine fisheries statistics of Kerala.

With respect to crafts in operation, Malappuram, Alappuzha, Kollam, Ernakulam and Kozhikode are the major mechanised fishing centers followed by Kannur, Thrissur, Thiruvananthapuram and Kasaragode. Taking into the account total number of crafts, Alappuzha stands first followed by Ernakulam, Thiruvananthapuram, Kollam, Thrissur, Malappuram, Kozhikode, Kasaragode and Kannur.

The leading fishing harbours of Kerala are also considered for the selection of sample.

There are seven fishing harbours operating in Kerala. One is at Neendakara in Kollam district, three harbours Beypore, Puthiyappa and Chombal are in the Kozhikode District and two are in the Ernakulam district, viz, Munambam and Kochi and the seventh one is at Mopla Bay in Kannur district.

After considering the above mentioned factors like fishermen populations, crafts in operations and harbours, the marine fishing region of Kerala is divided into three regions consisting of three sectors of operations. The three regions selected for the study are:- Southern - including Kollam, Thiruvananthapuram & Alapuzha, Central – Ernakulam & Thrissur and Northern- Malappuram, Kozhikode, Kannur & Kasaragode. From among the three regions a total of 450 fish workers are selected for the study. After collection of data from the 450 workers, i.e., 150 from each region, it was found that a few questionnaires are incomplete and not feasible for with analysis, so they are excluded from the study. Thus the total sample numbers came to be 402 workers. The distribution of the sample according to the three regions selected are as follows:-

Southern - 138 workers Central - 126 workers Northern - 138 workers

The sample selected from each region include workers belonging to all the three sub- divided sectors –such as

Traditional Non- Motorized sector (TNM)

Traditional Motorized sector and (TM)

Mechnanised sector (M)

This kind of a division is made with a view for measuring the impact of mechanization or motorization on fish workers. The sector wise and

region wise classification of the fish workers sample is presented in the following table.

Table 5.3

Distribution of Sample According to Fishing Region & Fishing Sector

Region	Fishing Sector			
	TNM	TM	M	Total
Southern	5 (26.67)	23 (24.21)	110 (38.46)	138 (34.3)
Central	7 (33.33)	35 (36.84)	84 (29.37)	126 (31.4)
Northern	9 (40)	37 (38.95)	92 (32.17)	138 (34.3)
Total	21 (100)	95 (100)	286 (100)	402 (100)

Note: Figures in bracket indicate percentage

Variable Selected for Measuring the Impact of Mechanization on Workers

To study the impact of mechanization of fishing industry on fish workers, the following variables are identified.

Socio-demographic conditions of workers

Activities of womenfolk among fishers

Ancestral occupation or traditionality of fishing operation

Social life index of fish workers

Income of workers during catchment season

Income of workers during off- season

Savings of workers and

Liabilities of workers

This chapter is an attempt to measure the impact of mechanization on fish workers on the basis of the above parameters identified.

5.1 Socio-Demographic Conditions of Workers

The various sub- variables selected for examining the sociodemographic conditions of fish workers are - religion, caste, age, education, size of family, place of residence and area of land possessed. The difference between workers belong to different sectors in relation to socio-demographic conditions of the workers is presented in table 5.4.

Table 5.4

Percentage Distribution of the Socio-Demographic Conditions of Workers According to Fishing Sector

Socio-demographic variables		Fishing sectors							
		TNM		TM		M		Total	χ^2
		No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage
Religion	Hindu	9	42.0	42	44.2	139	48.6	190	47.3
	Islam	5	23.8	30	31.6	17	5.9	52	12.9
	Christian	7	33.3	23	24.2	130	45.5	160	39.8
Caste	Araya	9	42.9	40	42.1	126	44.1	175	43.5
	LC	7	33.3	24	25.3	126	44.1	157	39.1
	Muslim	5	23.8	30	31.6	17	5.9	52	12.9
	Others			1	1.1	17	5.9	18	4.5
Age	<30	4	19.0	20	21.1	84	29.4	108	26.9
	30-39	2	9.5	25	26.3	95	33.2	122	30.3
	40-49	2	9.5	34	35.8	64	22.4	100	24.9
	50+	13	61.9	16	16.8	43	15.0	72	17.9
Education	Illiterate	3	14.3	5	5.3	16	5.6	24	6.0
	Read only	2	9.5	2	2.1	6	2.1	10	2.5
	Read & write	7	33.3	5	5.3	20	7.0	32	8.0
	Primary	6	28.6	46	48.4	117	40.9	169	42.0
	Secondary	3	14.3	35	36.8	113	39.5	151	37.6

	College & Above			2	2.1	14	4.9	16	4.0
Size of family	Upto 2	4	19.0	7	7.4	56	19.6	67	16.7
	3	8	38.1	38	40.0	127	44.4	173	43.0
	4	2	9.5	33	34.7	74	25.9	109	27.1
	5	7	33.3	17	17.9	29	10.1	53	13.2
Place of residence	Urban	2	9.5	10	10.5	15	6.2	27	6.7
	Rural	19	90.5	85	89.5	271	94.8	375	93.3
Area of land	Nil			7	7.4	14	4.9	21	5.2
	<5 cents	6	28.6	30	31.6	84	29.4	120	29.9
	5-9 cents	11	52.4	39	41.1	120	42.0	175	42.3
	10-19 cents	4	19.0	15	15.8	56	19.6	75	12.7
	20+ cents			4	4.2	12	4.2	16	

*Source : Survey data ** Significant at .01 level*

5.1.1. Religion & Caste

The religion and caste system played a great role in the social life of Kerala people. The caste system itself paved the selection of different works or means of livelihood and this is applicable to fisher folk also. The religion of the sample are 47.3% Hindu workers, 39.8% Christian workers and 12.9% Islam workers. When we look into the caste system the Araya caste, belong to the Hindu religion accounts for 43.5% of the sample. The second leading community is Latin catholics (39.1%) which belong to Christian religion and the Muslim community accounts for only 12.9%

As per the division of the sample according to different fishing sectors the Araya community dominates with 42.9% in traditional non-motorized sector 42.1% in traditional motorized sector and 44.1% in mechanised sector. Whereas the percentages of Latin catholic community are 33.3% in TNM 25.3% in TM and 44.1% in M. While caste distribution of Muslim counterparts are 23.8% in TNM, 31.6% in TM and only 5.9% in M. It is also notable that Latin catholic community equalizes with Araya community in the mechanised sector. This may be due to the attraction of the mechanised sector with regard to good returns- and naturally it paved the way for an uplift in the caste hierarchy through attracting others also to this sector. The X^2 value with respect to difference in religion and caste in relation to different sectors is statistically significant at .01 level. (Chi- square values are 46.95 & 49.75 respectively)

5.1.2. Age Group

The leading age group of the sample is 30-39(30.3%) followed by less than 30(26.9%)and 40-49(24.9%). The above 50 age group constitutes 17.9% of the sample.

When we relate the association between age and fishing sector, it is found that the majority of above 50 age group belong to TNM sector (61.9%) and 16.8% of them in the TM and 15% works in M. sector.

In the case of 30-39 group, 33.2% of the sample belong to mechanised sector followed by 26.3% in TM and only 9.5% workers in TNM sector. In less than 30 age group also the result is not so different as, 29.4% of them belong to M sector followed by 21.1% in TM and with only 19% in TNM. Majority of the 40-49 group workers in TM sector (35.8%) and 22.4% of them belong to M. sector. It is revealed that mechanisation attracts most of the youngsters group to either mechanised or motorised sector, but it slashes down the opportunity of aged ones in the fishing operations and thus most of the old ones concentrate on TNM sector

itself. The difference in age group related to people belonging to various fishing sectors is found to be statistically significant (χ^2-37.95).

5.1.3. Education

Kerala is the most literate state in India with a literate population of 90.92% (in 2002 census). Kerala's male literacy rate is 94.20% and female literacy rate is 87.86%[1] However, the condition of fishing community with respect to literary figures is not attractive.

The sample distribution according to education states that 42%(majority) have only primary level of education. 37.6% possessed secondary education and 6% of the sample are illiterates. In almost all primary schools located in the coastal villages of Kerala, student drop out ratio stands high when compared to other primary schools. If we look into the figures in a sector wise dimension it reflects that in TNM sector 14.3% are illiterates and another 42.8% does not posses school education, eventhough they can read and write. 28.6% of them have primary schooling , and 14.3% of them possess primary schooling. But the percentage of illiterates is found to be reduced to 5.3 in the case of workers belonging to TM sector and majority of them i.e., 48.4% possess secondary education and 36.82.1% possess even college education. In the case of mechanised workers majority possess primary education (40.9%) followed by 39.5% secondary education and 4.9% possess college level education. From this we can infer that the mechanised and motorised sector workers are more educated than their counterparts in TNM sector. This may be due to the upliftment in their life style or standard of living. Here also the difference in level of education to the workers of different sectors is statistically significant, at .01 level.

5.1.4. Size of Family

It is traditionally believed that the size of the family of fishermen community is very big, because of the non- influence of family planning

measures and the influence of the religious organisations on the life of fisher folk. Size of family of the sample reveals that 43% belong to 3 member family and only 13.2% belong to 5 & above member family. Here also the sector wise division showed that mechanised sector workers are more fond of small family system followed by TMsector. This reflects that the development in style of living and attitudes, results from mechanisation and motorisation leads to small size family concept. The difference in the size of family of the sample of different sectors is statistically significant (χ^2 value 21.57)

5.1.5. Place of Residence

The fishermen community from the times immemorial reside in the coastal region itself. Even after the 'Tsunami', when the government of Kerala tried to rehabilate them, the area selected was not acceptable to them because of the distance from coast.[2] Fisherfolk always prefer to live in the coast of the sea due to their ease in operation. This reflects in the sample also. Out of the total sample 93.3% live in rural area itself and only 6.7% live in urban area. There is not much difference in different sectors with regard to place of residence as shown by χ^2 test

5.1.6. Area of Land

It is observed that due to the poor socio-economic conditions of fisher folk in Kerala, their land holdings are also very small. But it is very encouraging to see that only 5.2% of the sample does not possess own land and majority (i.e. 42.3%) possess 5-9cents of land as their own. Only 4% of the total sample possess more than 20 cents of land as their own and they belong either to the mechanised or motorized sector (4.2% each). Here also the difference between land holdings and sectors of fishing is found to be not statistically significant. Hence it can be assumed that the sector of fishing operation is not at all a factor influencing the area of land owned by the fish workers in the state of Kerala

5.2 Activities of Womenfolk among Fishers

Traditionally the womenfolk among fishers were engaged in any of the fishing related work like fish vending, fish oil extraction, fish processing, fish net making etc. When their men were engaged actively in fishing, they played a crucial role in the sale of catches. Some social beliefs are also prevalent in relation to the activities of traditional fish women in coastal Kerala irrespective of the caste or religion. An attempt is made to know the participation of ladies in the fishing activity from the fishermen family. The result of the same is presented in table 5.5

Table 5.5

Sector wise Distribution of Women Working in Fishing Field of the Fishermen Family

		Fishing Sector						
		TNM		TM		M		
		No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage	χ^2
Women working in the fishing field	Yes	6	28.6	10	10.5	53	18.5	5.24
	No	15	71.4	85	89.5	233	81.5	
Name of operation	Fish vending	1	16.7	3	30.0	22	41.5	
	Net making			1	10.0			
	Fish curing	1	16.7	1	10.0	4	7.5	
	Peeling shed work	4	66.7	5	50.0	27	50.9	

Source : Survey data

It is clear that majority of the sample states that the ladies from their families are not engaged in any activity in relation to fishing. In three different sectors observed for the study, it is found that 71.4% from TNM, 89.5% from TM and 81.5% from M. sector are not engaged in any fishing related work. This difference is found to be not statistically significant also. From among those women who work in fishing operation, the majority are engaged in peeling shed work followed by fish vending. This also reflects the attitude of fish workers towards the operation of ladies in fishing activity. Meantime, available literature shows that most of the ladies from fishermen community operating in inland waters of Kerala operate in fish processing and fish vending activities.

5.3 Ancestral Occupation

It is believed that fishing is a traditional occupation of some particular castes inhabiting the seacoast. An attempt is made to examine the traditionality of occupation of the sample respondents The consolidated data as per the survey in this regard is presented in table 5.6

Table 5.6

Distribution of Ancestral Occupation According to Region

Region	Occupation	Grand Father		Father		Self		Children	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
Southern	Fishing	115	83.3	127	92.0	138	100.0	16	11.6
	Non Fishing	23	16.7	11	8.0	0	0.0	9	6.5
Central	Fishing	114	90.5	119	94.4	126	100.0	9	7.1
	Non Fishing	12	9.5	7	5.6	0	0.0	6	4.8
Northern	Fishing	116	84.1	135	97.8	138	100.0	7	5.1
	Non Fishing	22	15.9	3	2.2	0	0.0	0	0.0
Total	Fishing	345	85.8	381	94.8	402	100.0	32	8.0

	Non Fishing	57	14.2	21	5.2	0	0.0	15	3.7

Source: Survey data

The occupation of 85.8% grandfathers and 94.8% fathers of the respondents belongs to the fishing sector itself but the picture is different in the case of children i.e., only 8% of the children of the respondents are engaged in fishing. It highlights the migration of some others to this sector. When it is analyzed region wise, in the southern region 83.3% of grandfathers and 92% of fathers belong to fishing sector. In the central region 90.5% of grandfathers and 94.4% of fathers belonging to fishing sector and in northern region these figures are 84.1% and 97.8% respectively. So it is clear that the traditionality of occupation as believed is persisting even now in Kerala, in all regions though there are new entrants into this field from outside of the fishing community.

5.3.1. Sector wise Analysis

When we look into the traditionality of occupation, workers who are previously not engaged in fishing are also entered in fishing activity. An attempt is made to analyse the figures in another dimension i.e., according to fishing sector and the result is presented in table 5.7.

Table. 5.7

Distribution of Ancestral Occupation According to Sector

Region	Sector	Grand Father		Father		Self		Children	
		No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage
Southern	TNM	112	97.4	39	30.7	5	3.6	0	0.0
	TM	2	1.7	22	17.3	23	16.7	4	25.0
	M	1	0.9	66	52.0	110	79.7	12	75.0
t	TNM	113	99.1	82	68.9	7	5.6	0	0.0

	TM	0	0.0	20	16.8	35	27.8	6	66.7
	M	1	0.9	17	14.3	84	66.7	3	33.3
Northern	TNM	110	94.8	83	61.5	9	6.5	1	14.3
	TM	4	3.4	24	17.8	37	26.8	2	28.6
	M	2	1.7	28	20.7	92	66.7	4	57.1
	TNM	335	97.1	204	53.5	21	5.2	1	3.1
Total	TM	6	1.7	66	17.3	95	23.6	12	37.5
	M	4	1.2	111	29.1	286	71.1	19	59.4

Source : Survey data

Majority of the grandfathers of the sample belong to TNM sector in all regions. In southern region it is 97.4%, in central region it is 99.1% and in northern region it is 94.8% and all together 97.1% of grandfathers belong to TNM sector. While considering the sector in which fathers of the respondents in southern region only 30.7% belong to TNM and 17.3% belong to TM sector and a majority i.e., 52% belong to M sector. While in central region 68.9% of the fathers of respondents belong to TNM sector, 16.8% from TM sector and only 14.3% from M sector. The scene is almost similar in the case of northern region also, where 61.5% from TNM sector, 17.8% from TM sector and only 20.7% from M sector. This again proves the traditionality of fishing operation and at the same time affirm the fact that the mechanization process gains momentum at its early stages itself in the southern region than that of the other two regions. In relation to children of the respondents who started fishing operation also, it is very clear that they concentrate either on mechanised sector or on traditional motorized sector. This clarifies the fact that the traditional nonmotorized fishing operation has started disappearing from Kerala coast because only a few fishermen now operate in the traditional lines with catamarams and small thonies and most of them are aged ones. In the analysis regarding children also it is observed that the south dominates in mechanised fishing than the other two sectors. This may be because of the fact that the mechanization

process began in Sakthikulangara-Neendakara coast of Kollam district as part of Indo-Norwegian Project during 1950s.

5.4. Social Life Index of Fish Workers

For analyzing the effect of mechanization process on fish workers, at first a Social Life Index was developed based on certain generally accepted variables like land possession, ownership of house, form of house possessed, other available facilities like drinking water, toilet /sanitation, facilities like chair, table, cot, almirah, radio, television clock, computer etc. (The process of developing SLI with scores are given in appendix III)

As per the SLI the fish workers are categorized into three groups such as with Low SLI, Medium SLI and High SLI. To evaluate the SLI of fish workers of different regions according to the fish sector in which they belong to, the results obtained are shown in Table 5.8

Table 5.8

Region wise Comparison of Social Life Index of Workers According to Fishing Sector

Region	SLI	Fishing sector						χ^2
		TNM		TM		M		
		No. of workers	Percentage	No. of workers	Percentage	No. of workers	Percentage	
Southern	Low	3	60.0	3	13.0	9	8.2	
	Medium	1	20.0	14	60.9	57	51.8	14.7**
	High	1	20.0	6	26.1	44	40.0	
Central	Low	2	28.6	13	37.1	11	13.1	
	Medium	3	42.9	20	57.1	61	72.6	11.6*
	High	2	28.6	2	5.7	12	14.3	
Northern	Low	3	33.3	14	37.8	23	25.0	

	Medium	6	66.7	18	48.6	55	59.8	3.7
	High			5	13.5	14	15.2	
Total	Low	8	38.1	30	31.6	43	15.0	
	Medium	10	47.6	52	54.7	173	60.5	18.5**
	High	3	14.3	13	13.7	70	24.5	

*Source : Survey data ** significant at .01 level*

Significant at .05 level

In the southern region 60% of the sample of TNM belong to Low SLI group, 20% belong to Medium and another 20% belong to High. Whereas in the sample from TM sector, only 13% belong to Low SLI group, 60.9% Medium SLI group & 26.1% belong to High SLI group. In the case of mechanised sector the low SLI group form only 8.2%, while 51.8% belong to medium level and 40% belong to High Level. So it is evident that in the southern region motorisation process followed by mechanization process enabled the fishermen community to raise their social life standard. The social life index of mechanised fishermen group showed a clear rise in southern region than the other two regions also.

In the central region- sample taken from TNM sector showed that 28.6% belong to low SLI group, 42.9% in medium and 28.6% in high group. While sample from TM sector showed that 37.1% in low SLI group, 57.1% in medium SLI group & only 5.7% in high SLI group. At the same time sample from mechanised sector reveals that 13.1 % is in low SLI group. 72.6 % in medium group and 14.3% in high SLI group.

In the northern region TNM sector, 33.3% is found to be in low SLI group and the rest 66.7% in medium SLI group. The workers from TM sector state that 37.8% belong to low SLI group, 48.6% belong to medium SLI group and 13.5% belong to high SLI group. The sample workers of mechanised sector showed that 25% belong to low SLI

group, 59.8% belong to medium SLI group and 15.2% belong to high SLI group.

As per the facts and figures relating to the SLI of fish workers there is significant difference between the workers of different sectors and the difference may be due to the rise in income earning capacity, that resulted because of mechanisation/motorisation. (χ^2 at 1% level of significance is 18.5) This significant difference was present in the southern region also (χ^2 value at 1% level of significance at southern region is 14.7). In the case of central region also there is significance in the difference between workers of different sectors at 5% level of significance (χ^2 value at 5% level is 11.6). But the picture is different in the case of workers from northern region. There is no significance in difference between workers from different sectors. This is mainly because of the fact that the majority of the workers selected for the study from northern region, irrespective of the fishing sector belong to medium SLI group, and only a very few reached higher level.

To measure the impact of mechanisation in raising the SLI, the analysis was made in another dimension, that is, the SLI according to shift in fishing sector. Here the entire workers group is first divided into workers who:

(1) Started in TNM and not shifted from TNM sector
(2) Shifted from TNM to TM sector
(3) Shifted from TNM to M sector
(4) Started in TM
(5) Shifted from TM to M sector
(6) Started in M sector and not shifted from M sector
(7) Newly entered is M sector.

The social life index of the workers based on shift in fishing sector is represented in table 5.9.

Table .5.9
Distribution of Social Life Index According to Shift in Fishing Sector

Shift in fishing sector	Social life Index						χ^2
	Low		Medium		High		
	No. of workers	%	No. of workers	%	No. of workers	%	
TNM - TNM	8	38.1	10	47.6	3	14.3	
TNM - TM	22	32.4	37	54.4	9	13.2	
TM - TM	8	29.6	15	55.6	4	14.8	
Newly M	2	10.5	15	78.9	2	10.5	28.09 **
TNM - M	16	13.8	69	59.5	31	26.7	
TM - M	7	16.7	30	71.4	5	11.9	
M - M	18	16.5	59	54.1	32	29.4	

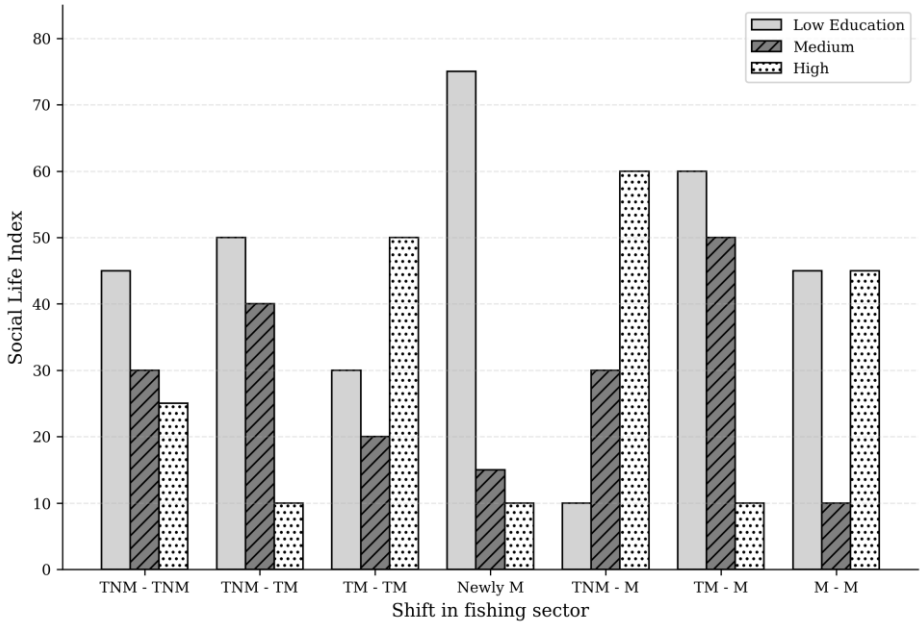
*Source : Survey data **Significant at .01 level*

The Table states that out of the group which stick on to the TNM sector 38.1% are in low SLI group and 47.6% in medium SLI group and only 14.3% are in high SLI group. Those who shifted from TNM to TM, 32.4% are in the low SLI group, 54.4% medium SLI group and 13.2% high SLI group. Of those who did not shift from TM sector 29.6% are in the low SLI group, 55.6% in the medium SLI group and 14.8% in the high SLI group. Those workers who are newly entered into mechanised sector indicates that only 10.5% low SLI, 78.9% medium SLI and another 10.5% high SLI. Those who shifted from TNM to M are having the SLI of 13.8% low, 59.5% medium & 26.7% high and those who shifted from TM to M 16.7 low, 71.4 medium and 11.9 high.

The difference between the SLI of different groups of workers who shifted from one sector to another shows a statistically significant

difference as per χ^2 test in their SLI. Hence it may be generalised that there is a significant change in the social life pattern in accordance with the shift in operation from one sector to another. The SLI of fish workers according to shift in fishing sector is graphically represented in Figure 1.

Figure 1
Social Life Index According to Shift in Fishing Sector



5.5 Income of Workers During Catchment Season

Income is considered as the chief factor in determining the potential of an employment especially from the point of workers. Workers are generally having a tendency of shifting from one job to another, from one place to another for earning better income. This tendency will be high, especially if they work in an industry which is seasonal in nature. Accordingly the income of fish workers during the catchment season is presented below both in terms of fishing sector and region. Here for comparing the income of workers from different fishing sectors and

regions – ANOVA is used. ANOVA enable us to test for the significance of the differences among more than two sample means.

Table 5.10

Region wise Income During Catchment According to Fishing Sector

Region	TNM		TM		M		F
	Mean	SD	Mean	SD	Mean	SD	
Southern	2460	826	5291	823	8453	1460	89.978**
Central	4800	3274	5100	1419	8289	1312	65.641**
Northern	4167	1090	4976	1202	7163	1498	44.059**
Total	3971	2158	5098	1206	7990	1537	179.50**
F	1.949		0.48		22.953**		

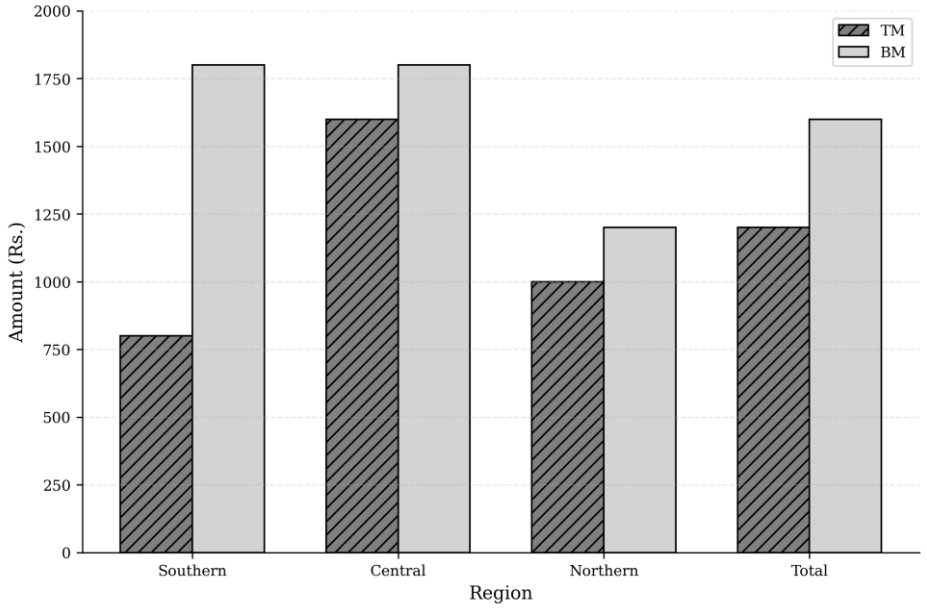
*Source: Survey data ** : Significant at 0.01 level*

The mean income of workers from mechanised sector is Rs. 7990 and TMRs. 5098 & TNM Rs.3971. Inevitably it is revealed that the mechanised fish workers possess more income in season than their counterparts in TM and TNM sector. In southern, central and northern regions also the situation is not different. The mean income of fish workers in the mechanised sector stands high in all regions but it is still high in southern region than the other two regions. This may be because, in south, mechanised boats are now providing up to 40% of their income to their workers, where normally it is 32 to 36%. In central and northern regions the share of income for workers is 35 or 36 percent. The raise in income by the mechanised workers than other sectors is mainly because of the assured income factor, i.e., 'bata' given to the mechanised workers even if there is no catch at all. The normal rate of bata is Rs. 100/day, but in big mechanised boats they provide Rs. 150/day for each worker. In addition to this the mechanised boats normally operate with 5 or 6 persons. But in the case of motorized crafts there are up to 20 workers in OBM fitted crafts and up to 50 workers in inbroad engine fitted crafts for normal working. In OBM fitted crafts 50% of the income after

meeting operational expenses is shared among the workers and in inbroad engine fitted crafts 40% of income barring all expenses is shared among the workers.

The graphical representation of the region wise mean income and that of fishing sector are exhibited in Figure 2.

Figure 2
Region wise Income During Catchment Season According to Fishing Sector



While analyzing the differences in income between the workers of different sectors, it is found that there is statistically significant difference in the income earned by them during catchment season. (F-value in south is 89.978, in central it is 65.641 and in north it is 44.059 and the total is 179.50)

With regard to the differences in income during the catch season among workers of the same sector between different regions, it is found that there is no significant difference between income during season of TNM and TM workers of different regions. However there is significant

difference in income of mechanised workers belong to different fishing regions (F=22.953 at 1% level of significance).

For having more clarity Scheffe Multiple Comparison was made for the income of workers during season. Here each pair i.e., TNM & TM, TNM & M, TM & M is analysed on region base and the paired region i.e., south & central, south and north and central and north is analysed on sector base also. Results of which are presented in Table 5.11.

Table 5.11

Scheffe Multiple Comparison of Mean Difference of Income During Season

Pair	Mean Difference			
	Southern	Central	Northern	Total
TNM & TM	2831.304**	300	809.009	1126.466**
TNM & M	5992.727**	3489.286**	2996.377**	4018.432**
TM & M	3161.423**	3189.286**	2187.368**	2891.965**
	TNM	TM	M	
South & Central	2340	191.304	163.442	
South & North	1706.667	315.629	1289.684**	
Central & North	633.333	124.324	1126.242**	

*Source : Survey data ** : Significant at 0.01 level*

The mean difference between TNM & TM, TNM & M, TM & M are found significantly different in south. But in central the pair TNM & TM is not found statistically significant, but the difference between TNM & M and TM & M is also statistically significant. In the north also the situation is almost as same as that of the central region. But with regard to total, the difference is found significant for all pairs at 0.01 % significance level.

But the region wise paired comparison showed that there is no significant difference in income between TNM workers of paired

regions and between TM workers of paired regions, though there is significant difference between income of workers during season belong to the mechanised sector in two pairs. They are between south and north & central and north. The difference in pair - south and central appears to be negligible.

For measuring the impact of mechanization in income earning capacity of the fish workers, the income earned during season by the workers of different sectors are analyzed in another point of view, i.e., income at season is compared with respect to shift in sector of fishing operation.

The result of the comparison is shown in Table. 5.12

Table. 5.12

Comparison of Income During Season under Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.	F
TNM - TNM	3971	2158	21	
TNM - TM	5137	1293	68	
TM - TM	5000	968	27	
Newly M	7863	1961	19	60.11**
TNM - M	8027	1459	116	
TM - M	7671	1389	42	
M - M	8095	1594	109	

*Source : Survey data **Significant at .01 level*

The mean income of fish workers increases in accordance with the shift in operational sector. Those who stick on to TNM itself earn less income than those who shifted to TM or M. The shift to mechanised sector increases the mean income of the worker impressively. This itself proves that there is a positive impact by the mechanisation in the income earning capacity of the fish workers. It is also proved that there is significance in the difference of income during season between different groups. To make it more clear Scheffe Homogeneous Subsets are formulated. When we compare the mean income given in Table 5.12 it

is found that there is no difference in mean income between those who remain in TNM, those who remain in TM itself, and those who shifted from TNM to TM. So they form part a subset. It is again found that the mean income between those who shifted from TM to M, those who shifted from TNM to M, those who entered newly into M and remained in M itself are alike. There is no significant difference among them, and form part a subset. To derive the point Scheffe Homogeneous Subsets formed here are shown in Table 5.13 below.

Table 5.13

Scheffe Homogeneous Subsets

Shift in fishing sector	Number	Subset for alpha = .05	
		1	2
TNM - TNM	21	3971	
TM - TM	27	5000	
TNM - TM	68	5137	
TM - M	42		7671
Newly M	19		7863
TNM - M	116		8027
M - M	109		8095

Source : Survey data

From the table it is inferred that those who operate in mechanised sector have more income in catchment season than those who operate in the other two sectors. So we conclude that the mechanization process has a positive impact on the income earning capacity of fish workers during catchment season.

5.6. Income of Workers During Off season

Income of fish workers during season depends on the 'catches' they get from the sea. The catches varies in accordance with time and climatic conditions. Nowadays most of the workers claim that the season is a

very short period that enables them to gain some sizeble income but most of the period in a year lies in the off-season period. Here an attempt is made to compare the income of workers during off-season period Table 5.14 shows the comparison of region-wise monthly income during off-season according to fishing sector.

Table 5.14

Region wise Income During Off-season According to Fishing Sector

Region	TNM		TM		M		F
	Mean	SD	Mean	SD	Mean	SD	
Southern	680	466	2547	209	3005	464	75.466**
Central	1430	1290	2269	452	3505	393	118.084**
Northern	928	250	2586	388	3104	567	79.919**
Total	1036	812	2460	405	3184	524	213.57**
F	1.446		7.056**		27.476**		

*Source : Survey data ** Significant at .01 level.*

An interesting factor observed during analysis is, that huge variation exists between the amount of savings among workers belonging to the same sector and region. To put it clearly, sometimes a mechanised worker may not possess any savings while another one from the same sector may record very sound savings. This itself gives ample evidence to the fact that attitude towards savings is not common among the workers.

The table shows a very clear difference in the savings pattern of workers belonging to different sectors and regions. F-value is 10.928 which is highly significant at 1% level of significance. So it can be concluded that the savings of workers differ significantly in accordance with sector and region.

While analyzing the savings pattern of workers belonging to the southern region, it is found that there is no significant difference with regard to different sectors. It is also found that the variation in savings

pattern among mechanised workers is very high. The southern region is considered to be the pioneer centre of mechanisation process in the state. Arne Martin Klausen in his study conducted during the implementation of Indo-Norwegian Pilot project, stated that the Latin catholic community inhabited at Sakthikulangara – Neendakara region reacted positively to the INP project, whereas the Araya Community showed certain inhibitions to the mechanization process. As a result the Sakthikulangara region even gained a nick name as 'Kochamerica' recently the trend is a different one – those having 40 feet and below sized mechanised vessels start selling it and a new class has emerged as owners of vessels with a fleet of boats as their own. In the meantime changes that occurred in traditional non-motorised sector also lead to good income and savings for them. Inspite of the havoc brought about by the 'Tsunami', that even shattered their dream, the fishermen community is found to be rebuilding themselves and even saving a portion of their income these days.

In central region, there is a clear difference between workers belonging to different sectors. There, as in the case of income, the workers of mechanised sector lead with a mean savings of Rs. 614. This shows that the workers do make savings in proportion to their income.

The distinction between savings pattern of workers belonging to different sectors is present in the northern region too. The F-value 18.486, and is highly significant at 1% level.

While analyzing the savings pattern of workers of the same sector from different regions, we may arrive at the following conclusion:-

¾ There is a significant difference between savings among TNM workers of different regions. (F-value 8.635) ¾ There is no significant difference between savings among TM workers of different regions. ¾ There is no significant difference between savings among M workers of different regions.

The difference found among TNM workers with regard to their savings is mainly because of the organized activities of fishermen societies, and other agencies working their behalf. Among the TNM workers in Puthuvypin, Kannamali, Saudi etc. the church authorities, fishermen co-operatives and the like are playing a good role in organizing them, providing facilities, mobilizing savings etc. That kind of an organized activity is not seen in the southern and northern regions.

For arriving at a clear finding about the difference in saving pattern among fishermen workers of different sectors and different regions, Scheffe Multiple Comparison of mean difference is used and the result is tabulated in table 5.19.

Table 5.19
Scheffe Multiple Comparison of Mean Difference of Savings During Season

Pair	Mean Difference			
	Southern	Central	Northern	Total
TNM & TM	180.87	133.429	169.489	161.97
TNM & M	526.636	378.333*	323.937**	413.132**
TM & M	345.767	244.905**	154.448**	251.162**
	TNM	TM	M	
South & Central	95.714**	48.273	52.589	
South & North	8.889	2.491	193.81	
Central & North	86.825**	50.764	141.222	

*Source : Survey data ** Significant at 0.01 level*

As per the table, it is clear that there is no significant difference between the workers of TNM & TM in all regions with regard to their savings but as regards TNM & M, a marked difference is found in central region, northern region and in total. But in south there is no significant

difference between TNM & M. The result is almost the same with regard to TM & M also.

Within sector the TM and M workers has no significant difference in savings at any region. But the TNM workers differ while comparing the south & central and the central & north regions On the contrary, there is no significant difference between TNM workers of south and north.

To find the impact of mechanization process on the savings pattern during season among workers, an analysis based on shift in sector of occupation is made. The entire sample group is divided into seven groups, such as:

Those who remained in TNM itself, Those who shifted from TNM to TM, Those who shifted from TNM to M, Those who remained in TM itself, Those who shifted from TM to M, Those who remained in M itself, and Newly entered into M.

Table 5.20

Comparison of Savings under Shift in Fishing Sector

Shift in fishing sector	Mean	SD	Number	F
TNM - TNM	175.7	62.3	21	
TNM - TM	319.4	149.1	68	
TM - TM	383.7	143.7	27	
Newly M	571.6	202.0	19	4.527**
TNM - M	544.9	357.5	116	
TM - M	483.8	191.9	42	
M - M	679.1	991.0	109	

*Source: Survey data **Significant at 0.01 level*

As per the table there is significant difference in saving pattern among different groups of workers (F value 4.527 at 1% significance level). The mean savings of workers of the modern group is the highest while

that of TNM group is the lowest. However, the savings of those workers who shifted from TNM to TM could increase their savings considerably

Here also for accurate results Scheffe Homogeneous Subsets are shown in table 5.21

Table 5.21

Scheffe Homogeneous Subsets

Change in fishing sector	No.	Subset for alpha = .05	
		1	2
TNM - TNM	21	175.7	
TNM - TM	68	319.4	319.4
TM - TM	27	383.7	383.7
TM - M	42	483.8	483.8
TNM - M	116	544.9	544.9
Newly M	19	571.6	571.6
M - M	109		679.1

Source : Survey data

Here the significant difference in savings during season is found only with TNM sector workers and M sector workers. All other sectors do not exhibit a significant difference between mean savings during season. Eventhough the change in sector increases their savings, such savings do not reveal much difference when compared with others. The two sectors which exhibit a significant difference are TNM and M.

5.8 Liabilities of Workers

Liability is a factor present in almost all the weaker sections of the community, especially in the fishing community. An attempt is made to analyse the liability of fish workers from different sectors and different regions in this study. As an initial process the sample group is sub-divided and presented in table 5.22 as those who have liability and those who do not have liability.

Table. 5.22

Distribution of Presence of Liability According to Fishing Sector

	TNM		TM		M		Z
	Number	%	Number	%	Number	%	
Yes	13	65.0	43	45.3	162	57.2	TNM - M: 0.679
No	7	35.0	52	54.7	121	42.8	TNM - TM: 1.605
							TM - M: 2.028 *

*Source : Survey data *Significant at 0.05 level*

65% of the workers from TNM sector, 45.3% of the workers from TM sector and 57.2% off the workers from M sector have liabilities. The comparison made with respect to TNM and TM workers show that there is no significant difference between the workers of these two sectors in having liability. The comparison between TNM and M workers also show the same result. Further, the comparison between workers of TM & M sector show that there is a significant difference between workers of these two sectors in respect of liability. For having better results a comparison is made with regard to change in sector. The results of the same are presented in Table 5.23.

Table 5.23

Comparison of Workers Having Liability According to Shift in Fishing Sector

Shift in fishing sector	Having liability		Not having liability		χ^2
	Number	Percentage	Number	Percentage	
TNM - TNM	13	65.0	7	35.0	
TNM - TM	31	45.6	37	54.4	
TM - TM	12	44.4	15	55.6	
Newly M	12	63.2	7	36.8	22.58 **
TNM - M	79	68.7	36	31.3	

TM - M	26	63.4	15	36.6
M - M	45	41.7	63	58.3

*Source: Survey data ** : Significant at 0.01 level*

The above analysis makes it clear that, there is a close association between change in sector and liability. Chi-square value is significant at 0.01 level. Therefore, the respondents having liability is further analyzed sector wise and region wise. The results of the same is presented in Table 5.24.

Table 5.24

Region wise Comparison of Liability According to Fishing Sector

Region	**Fishing Sector**						**F**
	TNM		TM		M		
	Mean	SD	Mean	SD	Mean	SD	
Southern	28750.0	8539.1	42111.1	41268.8	49645.8	57882.1	3.10*
Central	39166.7	23112.0	37000.0	30519.3	33261.9	29039.2	0.229
Northern	23333.7	25165.7	29923.2	45553.0	40084.5	27499.3	2.049
Total	32307.8	19855.1	35930.3	37158.4	40665.6	42133.9	1.298
F	0.691		0.293		3.577*		

Source: Survey data

Significant at 0.05 level

The major observation is that there is variation of liability among groups having liability. Some of the respondents recorded as having a small amount as liability, while some others recorded to have liability running upto lakhs of rupees. While analyzing the respondents having liability, region wise and sector wise, it is found that there is no significant difference among workers in respect of liability position, from different sectors and region except with regard to that of mechanised workers from different regions.

A significant difference is found between the mechanised sector workers of different regions with regard to their liability position. This may be due to the fact that the mechanised sector workers from southern region record a high amount of liability when compared to the central region workers.

For having a clear overview of this difference, Scheffe Multiple Comparison of mean difference for liability of workers is made. Result of the same is shown in Table 5.25.

Table 5.25

Scheffe Multiple Comparison of Mean Difference of Liability of Workers

Pair	Mean Difference			
	Southern	Central	Northern	Total
TNM & TM	13361.111	2166.667	6589.487	3622.487
TNM & M	20645.833	5581.821	16850.374	7957.867
TM & M	7284.722	3415.154	10260.887	4335.38
	TNM	TM	M	
South & Central	10416.667	5111.111	15810.987*	
South & North	5416.333	12187.957	9211.793	
Central & North	15833	7076.846	6599.195	

*Source : Primary *Significant at 0.05 level*

Taking this study into consideration, it is observed that the only group found to be different with regard to liability are workers from mechanised sector between south and central. So the conclusion derived earlier is found to be correct.

For gaining a clear insight regarding the impact of mechanization process in having liability the respondents having liability is analysed in

another dimension, i.e. based on shift in fishing sector and its result is presented in table 5.26.

Table 5.26

Comparison of Liability under Shift in Fishing Sector

Shift in fishing Sector	Mean	SD	N	F
TNM - TNM	21000.1	22337.1	20	
TNM - TM	17764.7	33889.4	68	
TM - TM	12481.5	20464.5	27	
Newly M	22369.3	34089.5	19	0.667
TNM - M	23921.8	29357.1	115	
TM - M	22414.8	28488.4	41	
M - M	22481.5	35965.8	108	

Source : Survey data

It is interesting to see that there is no association between shift in operating sector and the liability position. While making Scheffe Homogeneous Subsets also, the same result is obtained as shown below in table 5.27.

Table 5.27

Scheffe Homogeneous Subsets

Shift in fishing sector	Number	Subset for alpha = .05
		1
TM - TM	27	12481.5
TNM - TM	68	17764.7
TNM - TNM	20	21000.1
Newly M	19	22369.3
TM - M	41	22414.8
M - M	108	22481.5
TNM - M	115	23921.8

Source : Survey data

It is discovered that there is only one subset. It means no demarcation between sector of operation and liability position is observed. Whatever may be the operating sector, the position of liability is same among the fish workers. So the mechanization process or technological changes that have taken place in fishing sector do not have any influence over the liability position of workers of the marine fishing community.

Testing of Hypotheses

Hypothesis -1

Earlier we have formulated a hypothesis stating that, the shift in workers from one sector to another resulted in change in their social life index. The analysis of the same is made in this chapter as shown in table 5.9. As per Table 5.9, it is found that there is a change in SLI of workers who shifted from one sector to another. The hypothesis is then tested by using χ^2 test, and found that the difference between SLI of different groups shifting from one sector to another is statistically significant. The value of χ^2 is 28.09, which is significant at 0.01 level, hence the hypothesis may be accepted. So it is inferred that there is a significant change in the social life pattern in accordance with the shift in operating sector.

Hypothesis -2

The hypothesis number two as per chapter one stated that, the mechanisation process led to a marked improvement in the income level of workers during the catchment season. The analysis of data as per table 5.10 revealed that the mechanised fish workers earn more income in season than their counterparts in TM and TNM sectors. For testing the difference in income between the workers of different sectors F value is computed, and it is found that there is a statistically significant difference in the income earned by them during catchment season at 1 percent level of significance. Hence the hypothesis stands accepted. Accordingly, it is evident that there is a marked improvement in the

income level of workers belonging to mechanised sector during catchment season.

Conclusion

This chapter is intended to analyse the impact of mechanization of fishing industry on fish workers. A detailed analysis with regard to the selected variables like socio-demographic conditions, activities of ladies of fishermen households, traditionality of occupation, social life index of workers of different fishing sectors, income of workers during season, income of workers during off-season, savings of workers and the liability position of workers are made. The analysis revealed that the mechanized sector workers advanced a lot than their counterparts in TNM and TM sector with regard to education, small family system, land possession etc. The mechanization process attracts many from outside of the field fishing operation.

In the case of SLI also, the mechanized sector workers were found to be more advanced than the TM and TNM workers. When compared the income during season and off-season a clear advantage in income is seen among the mechanized sector. In savings also the workers in mechanized sector has a clear say. But there is an evidence regarding the fact that the workers if organized well can be encouraged to save a lot. But with regard to liability, the workers of different sectors does not differ significantly. So in the case of liabilities all the workers are alike. Altogether mechanization of fishing industry creates a positive impact on the fish workers.

References

[1] Govt. of Kerala, Economic Review – 2005, (Thiruvananthapuram: State Planning Board, February 2006) P. 337.

[2] 'Kannadi' (Malayalam), Asianet Television, Feb 2006.

CHAPTER VI

IMPACT OF MECHANISATION ON FISHING VESSEL OWNERS

This chapter is intended to analyse the impact of mechanisation of fishing industry on fishing vessel owners. Before proceeding to the analysis, it is better to define and understand the term 'vessel owner' in the study.

At first, it should be noted that the government does not make any demarcation between fish workers and vessel owners in the fishermen category. Such a categorization is relevant because the new entrants in the mechanised fishing sector do not belong to the traditional fishermen community, for most of them are mere capitalists. Even the scholarships and other concessions granted towards the upliftment of the fishing community go mostly to these few wealthy hands due to the lack of proper monitoring by the fisheries department. In this study, to measure the impact of mechanisation of fishing industry within the fishermen community an attempt is made to analyse it in two dimensions by dividing them into fish workers and fishing vessel owners. The term 'fishing vessel owner' is used to denote one who possesses a vessel used for fishing in marine fishing sector. The fishing vessel owner may be an owner of traditional fishing vessel like catamarans, thonies, the owner of traditional motorized fishing vessel like plywood out board marine boat, fibre glass boat, inboard engine fitted big vallom and may even be the owners of mechanised boats and trawlers. As the present study concentrates only on the fishing industry in relation to marine fishing the term 'fishing vessel owner' here means the owner of a fishing vessel engaged in marine fishing operation, hereafter termed as 'owners'.

Variables Identified

To study the impact of mechanisation of fishing on owners, the following variables are identified.

Socio-demographic conditions of owners.

Ancestral occupation or traditionality of fishing operation.

Social life Index of owners.

Income of owners during season.

Income of owners during off season.

Operating cost of fishing vessels.

Savings of owners during catchment season.

Liabilities of owners.

Return on Investment of owners.

An attempt has been made to measure the impact of each of the above identified variables on owners.

6.1 Socio-Demographic Conditions

As in the case of workers, various sub-variables are selected for examining the socio-demographic conditions of owners also. They are religion, caste, age, education, size of family, place of residence and area of land owned. The difference owners of different sectors in relation to the sub variables are tested statistically by using χ^2 test. The result of the same is exhibited in table 6.1.

Table 6.1

Percentage Distribution of Socio-Demographic Conditions of Owners According to Fishing Sector

Soico-demographic Variables		Fishing Sector			Chi-Square	p
		TNM	TM	M		
Fishing region	Southern	9 (50)	10 (25)	25 (35.2)	44 (34.1)	5.156
	Central	6 (33.3)	15 (37.5)	20 (28.2)	41 (31.8)	
	Northern	3 (16.7)	15 (37.5)	26 (36.6)	44 (34.1)	
Religion	Hindu	11 (61.1)	19 (47.5)	26 (36.6)	56 (43.4)	20.298 **
	Islam	3 (16.7)	15 (37.5)	10 (14.1)	28 (21.7)	
	Christian	4 (22.2)	6 (15)	35 (49.3)	45 (34.9)	

Caste	Araya	9 (50)	14 (35)	21 (29.6)	44 (34.1)	18.925 **
	LC	4 (22.2)	6 (15)	33 (46.5)	43 (33.3)	
	Muslim	3 (16.7)	15 (37.5)	10 (14.1)	28 (21.7)	
	Others	2 (11.1)	5 (12.5)	7 (9.9)	14 (10.9)	
Age	up to 30	2 (11.1)	11 (27.5)	20 (28.2)	33 (25.6)	11.721
	31-40	2 (11.1)	7 (17.5)	21 (29.6)	30 (23.3)	
	41-50	8 (44.4)	17 (42.5)	14 (19.7)	39 (30.2)	
	Above 50	6 (33.3)	5 (12.5)	16 (22.5)	27 (20.9)	
Education	Illiterate	2 (11.1)	2 (5)	6 (8.5)	10 (7.8)	9.084
	Primary	10 (55.6)	20 (50)	19 (26.8)	49 (38)	
	Secondary	5 (27.8)	17 (42.5)	39 (54.9)	61 (47.3)	
	College	1 (5.6)	1 (2.5)	7 (9.9)	9 (7)	
Size of family	2	4 (22.2)	3 (7.5)	9 (12.7)	16 (12.4)	18.454 **
	3	10 (55.6)	14 (35)	38 (53.5)	62 (48.1)	
	4	3 (16.7)	10 (25)	19 (26.8)	32 (24.8)	
	Above 5	1 (5.6)	13 (32.5)	5 (7)	19 (14.7)	
Place of residence	Rural	18 (100)	39 (97.5)	56 (78.9)	113 (87.6)	11.555 **
	Urban	0 (0)	1 (2.5)	15 (21.1)	16 (12.4)	
Area of land	Up to 5 cents	15 (83.3)	15 (37.5)	14 (19.7)	44 (34.1)	22.201 **
	6-15	3 (16.7)	24 (60)	52 (73.2)	79 (61.2)	
	Above 15	0 (0)	1 (2.5)	5 (7)	6 (4.7)	

Source: Survey data

*Note: Figures in brackets indicate percentage **Significant at 0.01 level*

6.1.1 Religion and Caste

The caste system plays an important role in determining different occupation or means of livelihood to different classes of people including fisher folk. The religion of the sample owners are 43.4% Hindus, 21.7% Islam and 34.9% Christians. When we look into the caste system the Araya caste, belonging to the Hindu religion accounts for 34.1% of the sample. The second leading community is Latin catholics (33.3%) belonging to Christian religion and the Muslim community accounts for 21.7% of the sample. Another interesting fact

noticed is, 10.9% of the sample does not belong to any of these three traditional fishing communities. This shows that a new group has entered fishing sector apart from the traditional fishing castes.

As per the division of the sample with regard to different fishing sectors; the Araya community dominates in traditional non-motorised sector covering 50% of the sample. This was followed by 22.2% Latin catholics and 16.7% Muslims and 11.1% other groups. In the TM sector, the Muslim community dominates with 37.5%, followed by Araya (35%) and Latin catholic (15%) and other groups (12.5%) while in the case of M sector, Latin catholic community dominates with 46.5% followed by Araya (29.6%), Muslim (14.1%) and other groups (9.9%). It indicates that even though the Araya community is the leading one, the Latin catholic community dominates in the mechanised sector. The owners from other communities are spread over all the three sectors and a slight increase was seen in TM sector. This is because, most of the inboard engine fitted big valloms are owned by some capitalist owners who belong to the fishing community. Such big valloms cost around Rs.30 to 35 lakhs, which is not affordable to the ordinary fisherfolk. A capitalist group entered the mechanised sector to generate high returns. The χ^2 value with respect to difference in religion and caste in relation to different sectors is found statistically significant at 0.01 level (chi-square values are 20.298 and 18.925 respectively).

6.1.2 Age Group

The leading age group of the sample is 41-50 (30.2%) followed by less than 30 years (25.6%) and 31-40 years (23.3%). The above 50 age group of owners constitute 20.9% of the sample.

When we relate the association between age and fishing sector, it is found that the leading age group in TNM (44.4%) and TM (42.5%) is in the 41-50 group. In TNM sector, the second leading age group is of above 50 years which accounts for 33.3% of the sample. Only 11.1% of

TNM vessel owners belong to below 30 age group and the same percentage is noted with respect to 31-40 age group also. While in TM sector the second leading group is below 30 age group with 27.5% of the sample followed by 31 to 40 age group with 17.5% of the sample. The above 50 age group constitutes only 12.5% of the sample. The picture is entirely different in the mechanised sector. i.e., the leading age group is 31 to 40 representing 29.6% followed by below 30 age group, accounting for 28.2%. The 41-50 age group constitutes 19.7% and above 50 age group constitutes 22.5%. This highlights the fact that mechanisation and motorisation attract many youngsters to the field of fishing and the aged ones lack opportunity in modern fishing vessels, and they stick on to the TNM sector. While testing the difference in age group of various fishing sectors, it is found to be statistically insignificant.

6.1.3 Education

It is commonly believed that the owners have good economic conditions, as a result they have good education also in comparison with fish workers. The sample distribution according to education states that majority of the owners (47.3%) have secondary level education, while it was seen that majority of the workers have only primary level education (Ref. chapter V). This supports the common belief stated earlier. Again, 38% of the sample possessed only primary education and 7% possess college level education. But here too 7.8% of the owners belong to illiterate category. This supports the fact regarding educational backwardness prevailing among the fisherfolk of Kerala. With regard to the figures in relation to fishing sectors, it is found that in TNM sector 11.1% are illiterates, 55.6% possess only primary level education and 27.8% have secondary schooling. Only 5.6% of them possess college level education. But in TM sector the percentage of illiterates is reduced to 5%. Here also the leading category is those who possess primary schooling (50%) followed by secondary level education (42.5%) and

only 2.5% possess college level of education. The scene is somewhat different in M sector. Here the leading category is that of those who possess secondary level education (54.9%) followed by those who have primary schooling (26.8%) and 9.9% of them possess college level education. From this it is understood that the mechanised sector owners are more educated than their counterparts in TNM and TM sectors. This is due to the uplift in their life style or standard of living as a result of the increase in income. While testing the difference in level of education of the owners of different sectors, it is found to be insignificant.

6.1.4 Size of Family

Normal belief regarding size of fishermen families were stated in the previous chapter. The family size of owners presents a picture contrary to the traditional beliefs i.e., 48.1% of the families constitute only 3 members another 24.8% possess 4 members and 12.4% families have only 2 members. Only 14.7% families have more than 5 members. The sector wise analysis show that in TNM sector 55.6% belong to 3 member families, 22.2% have only 2 members followed by 16.7% having 4 members and only 5.6% have more than 5 members. But in the TM sector 35% have three members, 25% with four members and only 7.5% have two members, and 32.5% of them have big families. The distribution of M sector is almost the same as that of TNM sector, in M sector 53.5% have three members followed by 26.8% with four members 12.7% with only two members and only 7% with five or more members. The concept of nuclear family is present among owners also. The big family system is not absent among TM owners because most of them are from the Muslim community. The difference in size of family of the sample of different sectors is statistically significant at 1% level.

6.1.5 Place of Residence

Fishing is the traditional occupation of those who inhabit the sea coast. The fishing vessel owners and workers always prefer to live in the

coastal area due to the ease in operation. The same is proved in the sample also. 87.6% of the sample lives in rural area while 12.4% lives in urban area. When we analyse it on the basis of different sectors of fishing, all those who belong to TNM are from rural areas and 97.5% of TM owners are also from rural area. Whereas 78.9% of M sector owners belong to rural area and the rest 12.4% of them are from urban area. The mechanisation process leads to such a slight change among the mechanised owners. Now in places like Sakthikulangara, there is an emerging trend among the mechanised owners to migrate to Ashramam, Chinnakkada and Anchukallummoodu. The difference in place of residence of fish vessel owners of different fishing sectors is found statistically significant (χ^2 value 11.55)

6.1.6 Area of Land

In the analysis of land possession of fishermen workers (in chapter V) it was found that majority of them own five to nine cents of land. That itself is a contradiction to the common belief regarding poor socio-economic condition of fisher folk. When we look into the assets of owners, it was seen that 61.2% of them possessed six to 15 cents of land, 34.1% have below five cents of land as their own and another 4.7% even possessed above 15 cents of land. The sector wise division showed that a vast majority (83.3%) from TNM sector possessed below five cents as their own while in TM and M majority of them have more than five cents but below 15. Here also the mechanisation process seems to generate a positive stroke. The difference between land holdings according to fishing sector is found to be statistically significant at 1% level of significance.

6.2 Ancestral Occupation

A major criticism against mechanisation from the fishermen community is the invasion of capitalists with high profit motive into the field of

fishing. An attempt is made here to examine the traditionality of occupation of owners.

Table 6.2

Distribution of Ancestral Occupation According to Region

Region	Occupation	Grand Father		Father		Self		Children	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
Southern	Fishing	37	84.09	44	100.00	4	9.09	0	0.00
	Non Fishing	7	15.91	0	0.00	40	90.91	0	0.00
Central	Fishing	34	82.93	35	85.37	41	100.00	3	7.32
	Non Fishing	7	17.07	6	14.63	0	0.00	38	92.68
Northern	Fishing	37	84.09	42	95.45	44	100.00	5	11.36
	Non Fishing	7	15.91	2	4.55	0	0.00	39	88.64
Total	Fishing	108	83.72	114	88.37	129	100.00	12	9.30
	Non Fishing	21	16.28	15	11.63	0	0.00	117	90.70

Source : Survey data

The occupation of 83.72% grandfathers and 88.37% fathers of the respondents is fishing itself, while the picture is different in the case of offspring, because only 9.30% of the children of the owners are engaged in fishing. The entry of a new group into the fishing sector is present here. When a region wise analysis is made, in the southern region 84.09% of grandfathers and 100% of fathers belong to fishing sector. In the central region 82.93% of grandfathers 85.37% of fathers belong to fishing sector and in northern region these figures are 84.09% and 95.45% respectively. Therefore it is clear that, eventhough the traditionality of the occupation as believed still persists in Kerala in these three regions, a non-fishing group has meantime newly entered into the field of fishing. Another important factor observed is the occupation of children; in the southern region no children from the

owner family are engaged in fishing and the figures are negligible in other regions also.

6.2.1 Sector wise Analysis

The ancestral occupation of the vessel owners in different fishing sectors is presented in table 6.3.

Table 6.3

Region wise Distribution of Ancestral Occupation According to Fishing Sector

Region	Sector	Grand Father		Father		Self		Children	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent
Southern	TNM	35	94.59	10	22.73	0	0.00	0	0.00
	TM	0	0.00	9	20.45	2	50.00	0	0.00
	M	2	5.41	25	56.82	2	50.00	0	0.00
Central	TNM	32	94.12	25	71.43	5	12.20	0	0.00
	TM	1	2.94	6	17.14	17	41.46	2	66.67
	M	1	2.94	4	11.43	19	46.34	1	33.33
Northern	TNM	37	100.00	18	42.86	3	6.82	0	0.00
	TM	0	0.00	13	30.95	16	36.36	4	80.00
	M	0	0.00	11	26.19	25	56.82	1	20.00
Total	TNM	104	96.30	65	57.02	18	13.95	0	0.00
	TM	1	0.93	22	19.30	42	32.56	8	66.67
	M	3	2.78	27	23.68	69	53.49	4	33.33

Source : Survey data

Majority of the grandfathers of owners belong to TNM sector in all the regions. In total 96.30% grandfathers of the sample are from TNM sector. In southern region it is 94.59%, in central region it is 94.12% and in northern region it even rounded up to100%. While considering the sector in which fathers of the respondents belong to, in southern region

only 22.73% belong to TNM, 20.45% belong to TM and a majority i.e., 56.82% belong to M sector. While in central region 71.43% of fathers are from TNM sector followed by TM (17.14%) and M (11.43%). The northern region also reveal a similar picture like that of central region. 42.86% fathers belong to TNM, 30.95% belong to TM and only 26.19% belong to M sector. This proves the traditionality of fishing occupation and testifies the fact that the mechanisation process gains momentum at its early stages itself in the southern region than that of the other two regions. While looking into case of the children of the respondents who started fishing operation also, it is very clear that they concentrate either on mechanised sector or on traditional motorized sector. The domination of south in mechanised sector is mainly due to the initiation of mechanisation process that took place at Neendakara in Kollam district.

6.3 Social Life Index of Owners

The SLI developed was used to analyse the effect of mechanisation process on owners.

Based on the SLI, the owners are classified into three groups such as- owners with low SLI, medium SLI and high SLI. The results of the same based on different regions and sectors are shown in table 6.4.

Table 6.4

Region wise Comparison of Social Life Index under Different Fishing Sectors

Region	Social Life Index	Fishing sector						χ^2
		TNM		TM		M		
		No.	%	No.	%	No.	%	
Southern	Low	2	22.2	1	10.0	0	0.0	NA
	Medium	7	77.8	3	30.0	0	0.0	
	High	0	0.0	6	60.0	25	100.0	
Central	Low	1	16.7	2	13.3	1	5.0	NA

	Medium	5	83.3	11	73.3	7	35.0	
	High	0	0.0	2	13.3	12	60.0	
Northern	Low	0	0.0	1	6.7	0	0.0	NA
	Medium	2	66.7	14	93.3	7	26.9	
	High	1	33.3	0	0.0	19	73.1	
Total	Low	3	16.7	4	10.0	1	1.4	53.27**
	Medium	14	77.8	28	70.0	14	19.7	
	High	1	5.6	8	20.0	56	78.9	

*Source : Survey data **Significant at 0.01 level*

In the southern region 77.8% of the sample of TNM belong to medium SLI group, 22.2% of them to low SLI group, and there is none in the high SLI group. In central region also the TNM sector owners share the same characters of southern region, as 83.3% of them belong to medium SLI group and the rest (16.7%) belong to Low SLI group. Whereas in northern region no one from the TNM sector is in low SLI group, while a majority (66.7%) belong to medium SLI group, and the rest (33.3%) belong to high SLI group. Altogether in TNM sector, majority of the owners are in medium SLI group and the rest belong to low SLI group and only a meagre percent (5.6%) is found in high SLI group.

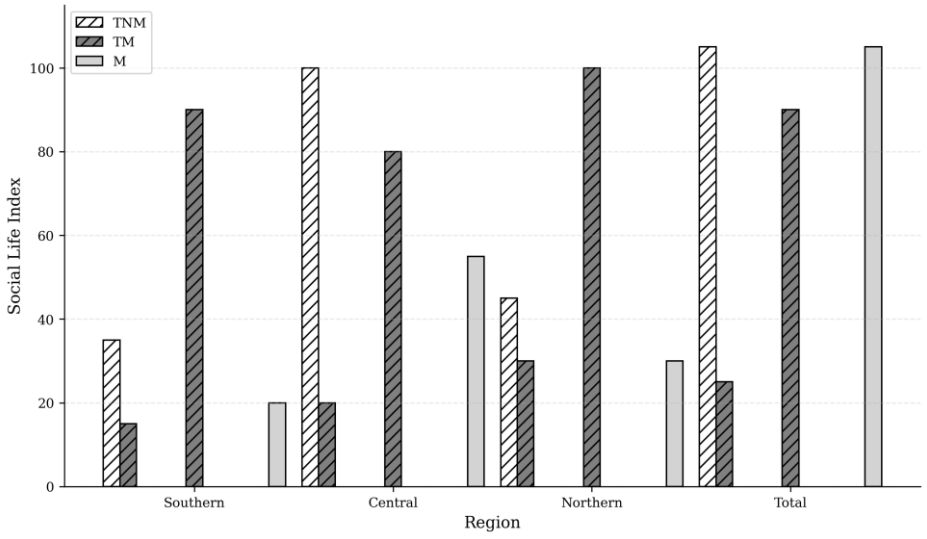
The TM sector vessel owners from southern region show that they gained much from modernization as 60% of them are in high SLI group, and 30% belong to medium SLI group, where as 10% belong to low SLI group. Meantime in central region majority (73.3%) of TM sector owners belong to medium SLI group and an equal number in both low and high groups (13.3 each). In northern region almost all TM sector vessel owners (93.3%) are in medium SLI group and the rest (6.7%) are in low SLI group. Altogether 70% of TM sector vessel owners are in medium SLI group and 20% in high SLI group and 10% in low SLI group.

The M sector owners from three fishing regions showed that 78.9% are in high SLI group, 19.7% in medium SLI group and 1.4% in low SLI group. In southern region all the sample units from M sector belong to high SLI group. In central region 60% are in high SLI group, 35% in medium SLI group and the rest 5% in low SLI group. In northern region 73.1% of them are in high SLI group and 26.9% are in medium SLI group.

From the above it is clear that M sector owners have better standards in their life than the other two sectors. The difference between three different sectors are analysed by using χ^2-test and it is found that the difference is statistically significant. In total the SLI of fish vessel owners from different sectors is also statistically significant (χ^2 – value at 1% level of significance 53.27)

The diagrammatic representation of SLI of owners in different fishing sectors is presented in Figure 3.

Figure 3
Region wise Comparison of Social Life Index under Different Fishing Sectors



To measure the impact of mechanisation in raising the SLI, the analysis was made in another dimension, that is, the SLI according to shift in

fishing sector among owners was also calculated. In this case the entire sample is divided into seven groups as follows:-

(i) Started in TNM and not yet shifted from TNM
(ii) Shifted from TNM to TM sector
(iii) Shifted from TNM to M sector
(iv) Started in TM and not shifted from TM sector
(v) Shifted from TM to M sector (vi) Newly entered in M sector
(vi) Started in M and remained in M sector itself.

Table 6.5

Comparison of Social Life Index According to Shift in Sector

Shift in fishing sector	Social Life Index					
	Low		Medium		High	
	No.	%	No.	%	No.	%
TNM - TNM	3	17.6	13	76.5	1	5.9
TNM - TM	4	14.3	16	57.1	8	28.6
TM - TM	0	0.0	13	86.7	2	13.3
Newly M	0	0.0	4	30.8	9	69.2
TNM - M	0	0.0	4	17.4	19	82.6
TM - M	0	0.0	2	33.3	4	66.7
M - M	1	3.7	4	14.8	22	81.5

Source: Survey data.

The table states that, out of those who remain in TNM sector itself, 76.5% are in medium SLI group, 17.6% in low SLI group and only 5.9% in high SLI group. It is seen that in the case of those who shifted from TNM to TM 57.1% are in medium SLI group and 28.6% in high SLI group. With regard to those who started from TM and remained in TM itself, 86.7% are in medium SLI group and 13.3% in high SLI group.

In the case of newly entered ones to M sector 69.2% are in high SLI group and the rest are in medium SLI group. Those who shifted from TNM to M and TM to M, majority of them belong to high SLI group, 82.6 and 66.7% respectively. In the case of those who belong to M sector itself also shows that 81.5% of them belong to high SLI group.

On the whole, those who shifted to M sector showed a comparatively good level of progress in their social life index. Hence it may be concluded that the mechanisation process helped to improve the SLI of those owners who shifted from TNM to M sector, from TM to M sector and also the newly entered ones in the mechanised sector.

6.4 Income of Owners During Catchment Season

Every investor makes investment in anticipation of a return. For measuring the impact of mechanisation on owners, a comparison is made on the income from vessels during catchment season. For comparing the income of owners from different fishing sectors and different fishing regions-ANOVA is used.

The mean income of owners across the three regions in different fishing sectors is exhibited in table 6.6.

Table 6.6

Region wise Income During Catchment Season According to Fishing Sector

	Mean	Southern	4167
		Central	3250
TNM		Northern	4167
		Total	3806
	SD	Southern	1458
		Central	699
		Northern	1152
		Total	1.2
TM	Mean	Southern	44000

		Central	44667
		Northern	42950
		Total	42950
	SD	**Southern**	11469
		Central	2194
		Northern	1769
		Total	0.2
M	**Mean**	**Southern**	97440
		Central	154750
		Northern	124732
		Total	124732
	SD	**Southern**	37659
		Central	28538
		Northern	44924
		Total	12.5**
	F	**Southern**	87.2**
		Central	137.8**
		Northern	121.6**

*Source : Survey data **Significant at 0.01 level*

The mean income of mechanised fish vessel owners is Rs.124732 and in TM sector, it is Rs.42950 and in TNM sector it is Rs.3806. From the above figures it is clear that the mechanised fish vessel owners earn more income during catchment season than their counterparts in TM and TNM sector. It is quite common that the investment in mechanised sector is high and as a result the return will also be high. In southern, central and northern regions also the picture is same. The mean income of mechanised owners stands high in all the three regions and it is very high in central region than the other two regions. This is because of the huge sized and modern facility equipped vessels in central region than the other regions.

Meantime boats in central region provide 35 to 36% share of catches only to workers, while in south, it is 40% to 45%. The mechanised vessel owners usually get 60 to 65% share of catches, while in TM sector it is 50% and in TNM, when the owner is a worker also, he will get two share out of three.

While analyzing the differences in income between vessel owners of different sectors, it is found that there is statistically significant difference in the income from vessels during catchment season. (F value in southern in region 37.2, 137.8 in central region and 36.5 in northern region).

With regard to the differences in income during catchment season among owners of the same sector between different regions, it is found that there is no significant difference between income during catchment season of TNM vessel owners and TM vessel owners of different regions, however there is significant difference in income from mechanised fishing vessels of different fishing regions. (F value is 12.5 at 1% level of significance). This significant difference is due to the above said factors also. Besides this, the central region is the leading center for export of marine products from Kerala.

For a better comparison Scheffe Multiple Comparison is made for income from fish vessels during catchment season. Each pair i.e., TNM & TM, TNM & M and TM & M are analysed based on different regions and the paired regions i.e.., southern & central, southern & northern, central & northern are analysed on the basis of different sectors, results of which are presented in Table 6.7.

Table 6.7

Scheffe Multiple Comparison of Mean Difference of Income During Catchment Season

TNM & TM	Southern	39383**
	Central	41417**
	Northern	35700
	Total	**39144****
TNM & M	Southern	93278**
	Central	151500**
	Northern	12405**
	Total	**120927****
TM & M	Southern	53440**
	Central	110083**
	Northern	87351**
	Total	**81782****
South & Central	Southern	583
	Central	4143
	Northern	26865
South & North	Southern	333
	Central	3467

Central & North	Northern	30445
	Southern	917
	Central	667
	Northern	5731**

*Source: Computed from Survey data **Significant at 0.01 level*

The mean difference of income between TNM & TM, TNM & M and TM & M are found statistically significant in southern and central regions. But the difference between TNM & TM is statistically insignificant in the northern region. Meantime the difference between TNM & M and TM & M are found significant in northern region also. With regard to total, the difference is found significant for all pairs at 1% level of significance.

But the region wise paired comparison show that there is no significant difference in income from vessels between the owners of TNM sector and also between the owners of TM sector of different regions. It is observed that there is a significant difference between income of owners of mechanised sector during catchment season among two pairs. They are between south & central and between south & north. But no significant difference is found in the pair central &northern regions.

For measuring the impact of mechanisation on income earning capacity of owners, the income earned during catchment season by the owners of different sectors are analysed in another dimension, i.e.., income earned from vessels during catchment season is compared with respect to shift in sector of fishing operation. The results of the comparison is presented in table 6.8.

Table 6.8

Comparison of Income During Catchment Season under Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.	F
TNM - TNM	3824	1185	17	
TNM - TM	49464	29387	28	
TM - TM	44567	36638	15	
Newly M	137923	37860	13	33.732 **
TNM - M	128913	45688	23	
TM - M	121000	42619	6	
M - M	112593	45810	27	

*Source : Survey data **Significant at 0.01 level*

The mean income of owners increases in accordance with shift in operational sector. Those who stick on to TNM sector itself earn less income than those who shifted to TM or M. The shift to mechanised sector increases the mean income to a great extent. At the same time the shift requires huge investment also. The increase in income in accordance with shift in operational sector proved that the mechanisation process increased the income of owners during season, eventhough huge investments are required. It is proved that there is significance in the difference of income during catchment season between different groups of owners. To make it more clear Scheffe Homogeneous Subsets are formed. When we compare the mean income given in table 6.8 it is found that there is no difference in mean income between those who remain in TM itself and those who shift from TNM to TM, so they form part a subset. It is again found that the mean income between those who remained in M itself, shifted from TM to M, TNM to M and entered newly into M are alike. There is no significant difference among them, and form part of a subset. The Scheffe Homogeneous subsets formed are shown in table 6.9.

Table 6.9

Scheffe Homogeneous Subsets

Shift in fishing sector	No.	Subset for alpha = .05	
		1	2
TM - TM	15	44567	
TNM - TM	28	49464	
M - M	27		112593
TM - M	6		121000
TNM - M	23		128913
Newly M	13		137923

Source : Survey data

From the table it is inferred that those who operate with vessels in mechanised sector have more income in season than the vessel owners of other two sectors. So, we conclude that the mechanisation process put forth a positive impact on the income of owners during catchment season.

6.5 Income of Owners During Off season

Owners of different fishing sectors always demand government assistance for the heavy losses that they face due to lack of income during off-season. Heavy operational cost to mechanised and motorized vessels and non-availability of fish during off-season even compel them not to operate vessels during off-season. In this circumstance a comparison of income from fishing vessels during offseason has utmost importance. It is quite natural that the income from fishing vessels depends on the catches they get from the sea. Meantime the owners and workers claim that the present catchment season lasts only for a very short period and rest of the period coming under off-season. Here an attempt is made to compare the income from fishing vessels during off-

season period. Table 6.10 shows the comparison of region wise monthly income during off-season according to fishing sector.

Table 6.10

Region wise Income from Fishing Vessels During Off-season According to Fishing Sector

Region	TNM		TM		M		F
	Mean	SD	Mean	SD	Mean	SD	
Southern	1611	546	12300	3561	11288	8794	7.5**
Central	1325	379	15600	2230	15050	3082	75.8**
Northern	1250	0	15600	1121	14773	8769	5.7**
Total	1456	457	14775	2694	13624	7718	35.1**
F	1.1		7.5**		1.8		

*Source: Survey data **Significant at 0.01 level*

While comparing the mean income of owners of different sectors, the TM sector owners lead with a mean income of Rs.14,775 when compared to their counterparts in M (Rs.13,624) and TNM (Rs.1456). Among the TM vessel owners the central and northern region earned a high mean income, i.e., Rs.15600 than the TM owners in southern region (Rs.12,300). The higher mean income during offseason among TM owners may be mainly due to less operating costs and the higher percentage share to owners in this sector when compared to M sector. The M sector vessels nowadays need very huge amounts for their day to day operation. So their income after operating expenses are low when compared to TM sector. In addition to that the mechanised owners are exploited by various middle men and commission agents. When comparing the income during off season of the owners of different sectors by using F test the following results are arrived at:

There is significant difference in the off-season income from fishing vessels of different fishing sectors in southern region. The F value is found to be 7.5, highly significant at 1% level of significance.

There is significant difference in the off-season income among owners of different sectors in central region. The F value is 75.8, highly significant at 1% level of significance, and

There is significance in the difference among the off-season income of different sectors in northern region. F value is 5.7, highly significant at 1% level of significance.

From the above findings it can be concluded that, irrespective of the fishing region, there is significant difference among off-season income of owners of different fishing sectors. This prove that even though the mechanisation process improved income of owners, the less operating cost of vessels in TM sector enables the owners in the TM sector to earn high income than others.

When we compare the off-season income from fishing vessels in another dimension, i.e., within fishing sector, according to region the following results are obtained:-

a. The off-season income of TNM owners does not vary in accordance with region. It means, there is no significant difference in the off-season income of owners of different regions.
b. There is significant difference in income during off season between TM owners of different regions. F value is 7.5, significant at 1% level, and
c. There is no significant difference in the off-season income of M sector owners of different regions.

The difference in income between regions found in TM sector owners is mainly due to the presence of more inboard fitted crafts in central region than the other two regions.

For arriving at a better inference the paired comparison technique is used and the observations as per Scheffe Multiple Comparison of mean difference of income during off-season is shown in table 6.11

Table 6.11

Scheffe Multiple Comparison of Mean difference of Income During Off-season

Pair	Mean Difference			
	Southern	Central	Northern	Total
TNM & TM	10689**	14275**	14350**	13319**
TNM & M	9677**	13725**	13523**	12168**
TM & M	1012	550	827	1151
	TNM	TM	M	
South & Central	286	3300**	3762	
South & North	361	3300**	3485	
Central & North	75	0	277	

*Source : Survey data **Significant at 0.01 level*

As per the table there is significant difference of mean income of owners during off-season between TNM & TM among the three regions. Similarly, the mean income between TNM & M also differ significantly in all the three regions. But the mean income of owners of TM & M do not differ significantly in any of the three regions. So it is clear that irrespective of the region, income of the owners of TNM & TM and TNM & M differ significantly, while the income of the owners from TM & M do not differ significantly during off-season.

With regard to the off-season income from fishing vessels according to paired regions, the results arrived at are as follows. Among the TNM owners there is no significant difference in income during off-season across the regions. But there is significant difference in off-season income of TM owners in south and central & south & north while in

central & northern regions, there exists no such difference. In the case of mechanised owners also there is no significant difference between the income across the regions.

To clarify the impact of mechanisation process on income position of owners during off season, an analysis based on shift in sector of fishing is made. The result of the same is shown in table 6.12.

Table 6.12

Comparison of Income During Off-season under Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.	F
TNM - TNM	1468	468	17	
TNM - TM	15143	2825	28	
TM - TM	13330	3956	15	
Newly M	16454	10756	13	12.127**
TNM - M	14117	9054	23	
TM - M	14750	6420	6	
M - M	11426	4443	27	

*Source : Survey data **Significant at 0.01 level*

When comparing the income of different groups such as those who remain in TNM itself, shifted from TNM to TM, remained in TM itself, shifted from TNM to M, shifted from TM to M, remained in M itself and newly entered into M, the difference in income of the owners is found to be highly significant as shown by the F value 12.127 at 1% level of significance.

Still for accurate results Scheffe Homogeneous Subsets are also formed. When we compare the mean income given in table 6.12 it is found that there is no difference in mean income between those who remain in TM itself and those who shift from TNM to TM, so they form part a subset. It is again found that the mean income between those who remained in M itself, shifted from TM to M, TNM to M and entered newly into M

are alike. There is no significant difference among them, and form part of a subset. The Scheffe Homogeneous subsets formed are shown in table 6.13.

Table 6.13

Scheffe Homogeneous Subsets

Shift in fishing sector	No.	Subset for alpha = .05	
		1	2
TNM - TNM	17	1467.6	
M - M	27		11426
TM - TM	15		13330
TNM - M	23		14117
TM - M	6		14750
TNM - TM	28		15143
Newly M	13		16454

Source : Survey data

When comparing the identical means, there are only two subsets. One for the owners who remained in TNM itself and another one for all others. This shows that the mean income during off-season of all others those who are either in TM sector or M sector are one and the same, but it differs from TNM sector vessels. Hence it can be concluded that the modernization process has enhanced the income of vessel owners during off season, but the mechanisation could not gain advantage above motorisation because of heavy operational cost and repairing charges. Here arises the need for comparing the operating cost of fishing vessels belonging to different sectors and different regions. Hence an attempt has been made as regards the operating costs of the fishing vessels.

6.6 Operating Cost of Fishing Vessels

Operating cost is a component to be considered for measuring the income of vessel owners. The operating cost of fishing vessels are almost same in catchment season and off-season. The operating cost of mechanised sector vessels include cost of fuel, ice, net, repairing, bata to worker, commission to agents and so on. Attempt is made to analyse the operating cost of vessels from different fishing sectors. In this context the region wise operating cost of vessels from different fishing sectors is presented in table 6.14.

Table 6.14

Region wise Operating Cost of Vessels According to Fishing Sector

Region	TNM		TM		M		F
	Mean	SD	Mean	SD	Mean	SD	
Southern	0	0	62800	37431	258120	21458	490**
Central	0	0	85200	52389	279600	17080	225.3**
Northern	0	0	79333	49239	270692	16826	230.3**
Total	0	0	77400	47523	268775	20336	837.3**
F	NA		0.7		7.6**		

*Source : Survey data **Significant at 0.01 level*

The TNM vessels do not have any operating cost, as they are operating on traditional lines. On the other hand the mean operating cost of vessels in TM sector is Rs.77400 and that of M sector vessels is Rs.268775. This shows that the mechanised vessels have more operating expenses than that of the TM sector vessels. All the three fishing regions reveal similar observations. The mean operating expenses of M sector vessels stand high in all the three fishing regions. The major reason for such a vast variation in operating cost is the difference in fishing grounds.

The area of operation for TM sector vessels ranges from 10 to 15 Nautical miles for OBM fitted crafts and 30 to 35 Nautical miles for inboard engine fitted big valloms i.e., to a maximum of 50m depth, and the mechanised boats operate at 250m depth. During season most of the vessels operate on a single day basis in their fishing region itself, so the operating cost during catchment season will be less when compared to other periods for mechanised crafts. In southern region, catchment season lasts for three months, usually they are the months of June, July and August. This is the peak season period for southern region boats. While in central and northern regions the catchment season lasts for another three months in addition to the above period, with comparatively good catches. This is usually during the months of September, October and November. During these months the mechanised vessels from southern region migrate to central and northern regions for fishing and it also increases their operating cost. While the OBM fitted and inboard engine fitted TM vessels can operate throughout the year in the same area itself. With regard to the differences in operating cost of vessels among fishing vessels of different sectors, it is found that there is statistically significant difference in the operating cost of vessels (F value in southern region is 490, in central region is 225.3, in northern region is 230.3 and for total is 837.3)

While analysing the differences in operating cost of vessels among vessels of the same sector between different regions, it is found that there is no significant difference between the operating cost among the vessels of TM sector of different regions, however there is significant difference in operating cost of vessels of mechanised vessels in different fishing regions (F value is 7.6 at 1% level of significance). This significant difference is due to the above said factors also. Besides this, the central region is the leading center for export of marine products from Kerala.

For a better comparison Scheffe Multiple Comparison was made for the operating cost of vessels. Each paired sector was analysed on the basis of different regions and the paired regions were analysed on the basis of different sectors. The results of the same are presented in table 6.15.

Table 6.15

Scheffe Multiple Comparison of Mean Difference of Operating Cost

Pair	Mean Difference			
	Southern	Central	Northern	Total
TNM & TM	62800**	85200**	79333**	77400**
TNM & M	258120**	279600**	270692**	268775**
TM & M	195320**	194400**	191359**	191375**
	TNM	TM	M	
South & Central		22400	21480**	
South & North		16533	12572	
Central & North		5867	8908	

*Source : Computed from Survey data **Significant at 0.01 level*

The mean difference between TNM & TM, TNM & M and TM & M are found significantly different among the three regions and in total at 1% level of significance.

The region wise paired comparison show that there is no significant difference in operating cost between TM vessels of different regions and between M vessels of south & north pair and central & north pair. But a statistically significant difference in operating cost among mechanised vessels in the south and central pair is found when the figures are analysed. This may be because of the comparatively less operating cost of mechanised vessels in southern region.

For deriving more clarity regarding the operating cost of vessels of different sectors, operating costs are compared from the point of view of

shift in sector of fishing operation, and the result of same is shown in table 6.16.

Table 6.16

Comparison of Operating Cost under Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.	F
TNM - TNM	0	0	17	
TNM - TM	93464	61890	28	
TM - TM	68200	64333	15	
Newly M	268308	17075	13	158.832**
TNM - M	272087	22681	23	
TM - M	266000	16273	6	
M - M	266556	21753	27	

*Source : Survey data **Significant at 0.01 level*

The result indicates that the operating cost of vessel increases in accordance with the shift in operational sector and that there is significant difference in operating cost among different groups. Scheffe Homogeneous Subsets are also formed for more clarity. When we compare the mean operating expenses given in table 6.16 it is found that the TNM vessels have no operating cost at all, and those who shifted from TNM to TM and remained in TM have no difference in their operating cost and form part a subset. All others, i.e., those who operate in M sector form another subset. The Scheffe Homogeneous subsets formed are shown in table 6.17.

Table 6.17

Scheffe Homogeneous Subsets

Shift in fishing sector	No.	Subset for alpha = .05		
		1	2	3
TNM - TNM	17	0		
TM - TM	15	68200		

TNM - TM	28	93464	
TM - M	6		266000
M - M	27		266556
Newly M	13		268308
TNM - M	23		272087

Source : Survey data

As per the table, vessels operating in mechanised sector incur more operating expenses than the vessels in the TM sector. It indicates that the shift to mechanised sector increases the operating cost, which in turn reduces the earning capacity of vessels. It is because their operating area and time of operation do not vary in accordance with the catchment season or off-season. This increase is mainly because of the length of operation during off-season. During off-season nowadays the mechanised vessels prefer overnight stay fishing at sea. The small size boats i.e. upto 40 feet even go for 'double day' and 'thrible day' fishing. Boats above 55 to even 70 feet prefer to fish for 10 days in sea at one turn. This will automatically lead to an increase in the operating cost because of various factors such as diesel, 'bata' to workers for all fishing days, ice and ration for workers. In addition to this, during off-season the mechanised vessels migrate to other regions or even go for fishing in other seas. During the off-season months i.e., December, January, February and March all the vessels in the three regions face a dull period. During this time, southern region boats operate in Kanyakumari sea, where they get somewhat reasonable catches. This is a period in which the mechanised vessels from the other two regions are compelled to come to Kanyakumari or to go to Bengal sea for fishing. This automatically increases their operating cost when compared to the southern region vessels.

The major reason for the boat owners' claim that the mechanised fishing sector is facing huge losses, is the heavy operational cost. During off-season almost 90% to 95% of the catches are eaten up in the form of operating cost. For the small size boats the heavy operating cost even call for debt burden on the vessel owners. These details can be subjected to analysis in another dimension i.e., the mean return on investment of each sector are also computed here to record the impact of mechanisation on fishing industry. They will be examined at the end of this chapter.

6.7 Savings of Owners During Catchment Season

Savings, the rare phenomena found among fishermen community and how it reflects in the owner category especially during the catchment season need to be observed. Does the mechanisation process generate any positive attitude towards savings? As an initial process the sample group is subdivided and presented in table 6.18 as those who have savings and those do not have savings.

Table 6.18
Distribution of Presence of Savings According to Fishing Sector

	TNM		TM		M		Z	
	No.	Percent	No.	Percent	No.	Percent		
Yes	6	33.3	18	45.0	43	60.6	TNM - M	2.074 *
No	12	66.7	22	55.0	28	39.4	TNM - TM	0.835
							TM - M	1.582

*Source : Survey data *Significant at 0.05 level*

In TNM sector 66.7% of owners have no savings at all and only 33.3% have savings during catchment season. While in TM sector 55% owners maintain savings during catchment season and 45% record no savings. Whereas in M sector 60.6% of owners possess savings and the remaining 39.4% have no savings. The comparison made with respect of

TNM and TM sector owners show that there is no significant difference between them in maintaining savings. The comparison between TNM and M sector owners differ significantly with regard to the presence of savings. From the analysis, it is found that the vessel owners from TM and M do not differ significantly in relation to savings. As a second step for a better results those who have savings are further compared on the basis of their fishing sector. The results of the same are shown in table 6.19.

Table 6.19

Comparison of Vessel Owners Having Savings During Catchment Season According to Fishing Sector

	Mean	SD	No.	F	Scheffe Multiple Comparison	
TNM	209	93	6		TNM vs TM	262.9
TM	472	194	18	3.269*	TNM vs M	470.3
M	679	569	43		TM vs M	207.4

*Source : Computed from Survey data *Significant at 0.05 level*

The mean savings of mechanised sector owners is high when compared to other two sectors. The above analysis also make it clear that, there is significant difference between the savings during catchment season in different sectors of fishing (F-value 3.269, at 5% level of significance). The Scheffe Multiple Comparison result shows that there is no significant difference in the savings pattern of owners across the fishing sectors.

The vessel owners having savings during catchment season are also analysed on the basis of shift in fishing sector. The results of the same are presented in table 6.20.

Table 6.20

Comparison of Vessel Owners Having Savings According to Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.	F
TNM - TNM	209	93	6	
TNM - TM	427	202	13	
TM - TM	607	175	7	
Newly M	920	759	10	1.859
TNM - M	523	267	11	
TM - M	500	0	2	
M - M	664	626	18	

Source : Computed from Survey data

Eventhough the mean savings increase slightly in accordance with shift in fishing sector, the analysis make it clear that there is no significant difference among the owners across different sectors with regard to savings during catchment season.

6.8 Liability of Owners

Liability arising out of employment determines the scope and future of the job and act as a force among the owners to pay off or to reduce the same. Is there any influence for mechanisation process on the liability position? To examine this the sample is first divided into two groups such as those who have liability and those who do not have liability. The result is presented in table 6.21.

Table 6.21

Distribution of Presence of Liability According to Fishing Sector

	TNM		TM		M		Z	
	No.	Percent	No.	Percent	No.	Percent		
Yes	6	33.3	26	65.0	45	63.4	TNM - M	2.302*
No	12	66.7	14	35.0	26	36.6	TNM - TM	2.243*

	TM - M	0.171

*Source : Survey data *Significant at 0.05 level*

Majority of the owners (66.7%) from TNM sector have no liability. But 65% of the owners of TM sector and 63.4% of owners of the M sector do have liabilities. For more clarity and precision those who have liability among the owners are further compared on the basis of their fishing sector and the result is shown in table 6.22.

Table 6.22

Comparison of Vessel Owners Having Liability According to Fishing Sector

	Mean	SD	No.	F	Scheffe Multiple Comparison
TNM	33250	25027	6		TNM vs TM
TM	108269	136879	26	4.966**	TNM vs M
M	191022	153679	45		TM vs M

*Source : Survey data **Significant at 0.01 level*

The mean liability of M sector owners is very high (Rs.191022) when compared to TM (Rs.108269) and TNM (Rs.33250). It also shows that, there is statistically significant difference in liability across the fishing sectors (F value 4.966, highly significant at 1% level of significance). The Scheffe Multiple Comparison results reveal that there is no significant difference in the liability pattern of owners between TNM & TM and between TM & M. But the difference between TNM & M is found statistically significant.

For further analysis, the owners having liability are analysed on the basis of shift in occupational sector also. The liabilities of the owners according to shift in fishing sector is exhibited in table 6.23.

Table 6.23

Comparison of Vessel Owners Having Liability According to Shift in Fishing Sector

Shift in fishing sector	Mean	SD	No.
TNM - TNM	29900	26435	5
TNM - TM	161500	203192	20
TM - TM	48125	43992	8
Newly M	169091	99544	11
TNM - M	191786	104525	14
TM - M	106250	65749	4
M - M	191733	176991	15

Source : Survey data

Eventhough the mean liability has increased very much in accordance with change in fishing sector towards M sector, there is no significant difference in liability according to shift in fishing sector.

6.9 Return on Investment of Owners

While computing the income from vessels after meeting the operating costs during catchment season, the mechanised vessels showed a higher mean than their counter parts in the other two sectors. With respect to shift in operational sector also, M sector owners recorded higher means than those who remained in TNM and TM. But in the case of income during off-season the TM sector vessels are leading with a higher mean income than M sector vessels. This is because of higher operating costs during off-season to the M sector vessels. When the operating costs were analysed it was found that the M sector vessels have high operating costs than the other two sectors. Eventhough the M sector incurs high operating cost during the catchment season, due to its good catches, the income of this sector continues to be the highest during the catchment season when compared to the other two sectors. So an analysis regarding return on investment based on income from vessels and investment in vessels is found inevitable. Hence an attempt is made

to measure the relation between annual income to investment, savings to investment, and liability to investment. The investment in each sector is computed by finding out the average cost of vessels in the respective sector. The income from fishing vessels is estimated by considering both seasonal monthly income and off-seasonal monthly income. For converting it into annual income, the period of catchment season and off-season for different regions, and the period of non-operation to different sectors were also considered. The figures of savings and liability shown in the analysis are taken on annual basis.

For comparing the ROI of vessels of different fishing sectors, the annual income (i.e. income from catchment season and off-season) are calculated. The computation of annual income was done on the basis of the months of catchment season and off season in different regions. In the case of M sector vessels the trawling ban period was considered as a period having zero income. The annual income thus arrived is then compared with the investment made in the fishing vessel (i.e. cost of vessel). The result of the same is given in Table 6.24

Table 6.24
Mean Percentage of ROI under Different Sectors

	Mean percent of ROI	SD	No.	F	Scheffe Multiple Comparison	
TNM	175.6	71.2	6		TNM vs TM	64.339
TM	111.3	70.9	18	11.443**	TNM vs M	106.804**
M	68.8	46.0	43		TM vs M	42.465*
Total	89.8	64.1	67			

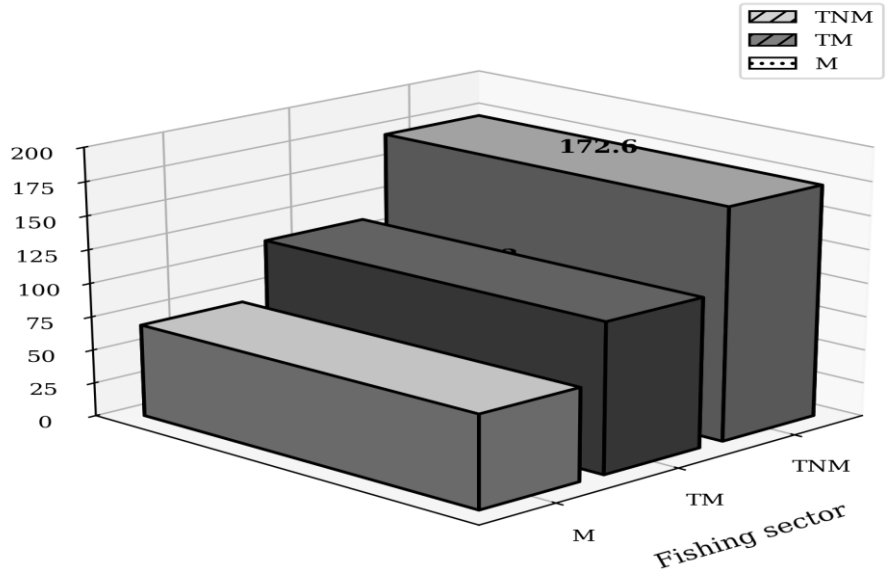
*Source : Survey data **Significant at 0.01 level *Significant at 0.05 level*

The income from catchment season and off season, from different fishing sectors such as TNM, TM and M, are taken as such for converting into annual income. The income is computed, after deducting

operating expenses. Therefore, for measuring profitability the ROI is computed. The mean percent of ROI among fishing vessels of TNM sector stands high (175.6) followed by TM (111.3) and M (68.8). It is mainly because of the fact that there is uninterrupted operation by TNM sector vessels throughout the year and that the investment required is very low. Their operating costs as we found is also zero. While in M sector the investment and operating costs are very high. The significance of difference in ROI between vessels from different sectors is statistically significant (F value 11.443, at 1% level). While making Scheffe Multiple Comparison the difference in ROI of TNM & TM are found insignificant while the difference is significant between TNM & M and between TM & M.

The mean percentage of ROI of owners of different fishing sectors is pictorically represented in Figure 4.

Figure 4
Mean Percentage of ROI under Different Sectors



6.9.1 Comparison of Savings to Investment

The term savings is the total of savings made by vessel owners in savings bank account, post office savings, life insurance policy, co-operative banks, and local chit funds. The savings of vessel owners is found increasing in accordance with shift in fishing sector but no significant difference is found between vessel owners regarding savings during catchment season. Here the savings of vessel owners are compared with the investment made in vessels (i.e., cost of vessels) to arrive at a clear pattern of savings. The result of the same is given in table 6.25.

Table 6.25
Comparison of Savings to Investment According to Fishing Sector

	Mean	SD	No.	F	Scheffe Multiple Comparison	
TNM	16.5	10.4	6		TNM vs TM	14.652**
TM	1.8	1.4	18	70.449**	TNM vs M	15.717**
M	0.8	0.8	43		TM vs M	1.065
Total	2.5	5.4	67			

*Source : Survey data **Significant at 0.01 level*

The mean savings to investment is high (16.5) in TNM sector. It is only 1.8 in TM sector and 0.8 in M sector. The difference in savings based on investment is found significant among the three fishing sectors. (F value 70.449, at 1% level).

The higher mean proportion in savings in the TNM sector may be because of lower cost of investments and the reverse is observed in TM and M sectors.

While making Scheffe multiple comparison the difference in the proportion of savings to investment is found statistically significant between TNM & TM, and between TNM & M. But the difference in

proportion of savings to investment is insignificant between TM & M, because both are now having similar characters.

6.9.2 Comparison of Liability to Investment

The total liability of owners of different sectors are compared with the investment (cost of vessels) and the results of the same are shown in table 6.26.

Table 6.26
Comparison of Liability to Investment According to Fishing Sector

	Mean	SD	No.	F
TNM	39.4	62.1	6	
TM	20.6	31.0	18	1.794
M	17.2	16.1	43	
Total	20.1	27.3	67	

Source : Survey data

Here also the mean proportion between liability and investment is the highest in TNM (39.4) sector and in TM sector it is 20.6 and in M it is 17.2. The difference in proportion of liability to investment between owners of different sectors is insignificant.

Testing of Hypotheses

Hypothesis 3

The hypothesis number three developed earlier stated that, the mechanisation process led to a marked improvement in the social life index of owners. The analysis with regard to the social life index was shown in table 6.4. As per χ^2 test applied, it was seen that there is statistically significant difference in the SLI of owners belonging to different fishing sectors at one percent level of significance. Therefore, we accept the hypothesis and can conclude that the mechanisation process led to a marked improvement in the SLI of fish owners.

Hypothesis 4

The fourth hypothesis, as shown in chapter one was that there is no significant difference between return on investment of vessel owners of different sectors. The analysis of the same was presented in table 6.24. From the analysis it is clear that the ROI of TNM sector stands high, followed by TM and M. This results from less investment and low operating cost. When the difference in ROI was analysed by finding out F-value, it was found that, the difference in ROI is statistically significant across the fishing sectors (F value 11.443, at 1% level). Hence the hypothesis may be rejected. So, we conclude that there is a significant difference in ROI of owners of the three fishing sectors.

Conclusion

From the analysis of impact of mechanisation on owners it is found that the mechanisation process attracts many youngsters to the fishing field and reduces the opportunity of old ones. Simultaneously it also encourages outsiders from other industrial sectors, and this leads the entry of capitalists in the field of fishing. The mechanisation process provide a positive stroke in the field of education also. It raises the standard of living of fisherfolk and the income during catchment season. During off-season the TM sector vessels have more income than M sector vessel because the mechanised vessels suffer increased cost of operation. With regard to savings and liability the three sectors do not have any significant difference and exhibits uniformity. While analysing the profitability based on annual income and investments, the mean percentage of income is high in TNM sector because of low operating cost and uninterrupted operation throughout the year. The comparison based on savings to investment and liability to investment also reveal the same thing. So it may be concluded that the mechanisation process create a positive stroke in the owners of vessels by raising their income, standard of living, eduction etc. But when comparing the ROI, the

returns now received from vessels are not encouraging. Higher investment and higher operating costs are the major reasons for the same. In this context an attempt is made to analyse the problems and prospects of mechanised fishing industry, which will be examined in the next chapter.

CHAPTER VII

PROBLEMS AND PROSPECTS OF MECHANISATION

Change is an inevitable factor for all economic activities. The primary reason for change is technological advancement in all fields. The fishing sector has witnessed a lot of economic changes. The most reliable source to discuss or assess the changes in a field are the people themselves who are in constant touch with the field, or are a part of the field. Therefore, to measure the prospects and problems, the best way is to interact with the workers who are actively involved in the fishing operation and the owners of fishing vessels, who are involved in and have invested in this activity.

The present chapter is designed to analyse the problems and prospects of mechanised fishing industry in three different stages.

- The first part analyses the views of workers of the industry.
- The second part analyses the views of owners of the industry and
- The third section analyses the secondary data with regard to production and export of the industry for the last 15 years.

7.1 Workers' Views on Prospects and Problems of Mechanisation

To analyse the views of workers with respect to prospects and problems of the industry, the following parameters are used.

- workers view on prospects of mechanisation
- workers view on problems of mechanisation
- workers view on trawling ban
- workers opinion regarding reasons for absence of a steady growth in production and export of fishing industry
- workers suggestions to improve the fishing industry.

7.1.1 Prospects of Mechanisation

The prospects and fortunes of fishing industry on account of mechanisation among workers of different fishing sectors are examined. The comparison of rank positions of scores among the different sectors

of fishing on the prospects of fishing industry in accordance with mechanisation is given in table 7.1. Kruskal Wallis Test works by looking at differences in the ranked positions of scores in different groups. Therefore, the ranks of opinions are converted into scores from lowest to highest. The group that has the highest mean rank should have a greater number of high scores within it.

Table 7.1

Workers' Views on the Prospects of Post Mechanised Fishing Industry

Prospects	Fishing Sector TNM		Fishing Sector TM		Fishing Sector M		Kruskal Wallis Test	p
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank		
Increase in income	11	126.3	49	89.6	143	104.4	5.15	p>0.05
Reduction in manual efforts	13	130.3	87	143.6	191	148.2	0.84	p>0.05
Increase in catches	14	100.7	44	61.1	139	110.8	27.86	p<0.01
Increase in exports	5	38.4	12	23.4	69	47.4	10.37	p<0.01
Generation of more employment	7	69.7	48	79.0	97	75.7	0.37	p>0.05
Access to new fishing grounds	14	129.5	69	139.6	187	134.4	0.33	p>0.05
Able to catch more varieties of species	8	120.0	47	114.3	156	102.8	1.85	p>0.05
More	1	45.0	11	32.2	35	20.8	8.79	p<0.05

consumption								
Reduce time for operation	7	68.9	31	77.5	108	72.7	0.42	p>0.05
Attraction to many young ones	2	60.8	19	38.3	59	40.5	1.76	p>0.05

Source : Survey data

From the table 7.1, it can be seen that eleven workers from the traditional non-motorised fishing sector with a mean rank of 126.3 have the opinion that the income level increased due to mechanisation of fishing industry. The number of workers from TM and M sectors responded for the same opinion are 49 and 143 with average rank of 89.6 and 104.4 respectively. On comparing the average ranks among the three sectors, Kruskal Wallis test statistic is insignificant. It means that the workers of TNM, TM and M have more or less the same opinion about the fact that the income level increased due to mechanisation. Similarly 13 workers from TNM sector gave ranks to the opinion that the manual efforts on fishing reduced due to mechanisation with an average rank of 130.3. The number of workers from TM and M sectors responded for the same opinion are 87 and 191 with average rank 143.6 and 148.2 respectively. As per the KW test, this is also insignificant. i.e., the workers of TNM, TM and M have same opinion about reduction of manual efforts on account of mechanisation of fishing industry.

With regard to the opinion about increase in catches, 14 workers from TNM sector with an average rank of 100.7 have such an opinion. The number of workers from TM and M sectors responded for this opinion are 44 and 139 with an average rank 61.1 and 110.8 respectively. The comparison of average ranks revealed that, the test statistic is significant. So the workers of TNM, TM and M significantly differ on the opinion about increase in catches due to mechanisation of fishing

industry. The difference found is significant with regard to the opinions like: increase in exports and increase in consumption which result from mechanisation of fishing industry. In all other opinions, viz., generation of more employment opportunities, accessibility to new fishing grounds, ability to catch more varieties of species, reduces time for operation and creation of more attraction to young ones to the fishing field, the workers of TNM, TM and M have more or less same opinion.

To test whether the uniformity in those opinions as expressed by the workers of the three sectors is significant or not, rank correlation matrix is applied and the results of the same is tabulated in table 7.2.

Table 7.2

Rank Correlation Matrix on Prospects of Mechanisation in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.95**	1	
M	0.93**	0.83**	1

*Source : Survey data **Significant at 0.01 level*

The spearman's rho rank correlation between the rank order of TNM and TM about the prospects of fishing industry under mechanisation is 0.95, which is significant at 0.01 level. It means that there is statistically significant relation between the opinion of workers from TNM and TM. Similarly the rank correlation between TNM & M and TM & M are 0.93 and 0.83 respectively and which are also significant at 0.01 level. Therefore, it can be concluded that in respect of those opinions which are insignificant (i.e. more or less same opinion) as per KW test, are significantly correlated at 1% level of significance.

7.1.2 Problems of Mechanisation

The comparison of rank positions of scores among the different sectors of fishing on the problems of mechanisation is given in table 7.3.

Table 7.3

Problems of Workers in Various Sectors

Consequent to Mechanisation

Problems	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Entry of more capitalists	10	59.0	33	81.5	98	68.7
Reduction in days of employment	5	54.7	31	64.5	93	66.7
Reduction in prices for catches	13	112.4	46	101.1	165	107.9
Over exploitation of sea wealth	18	201.4	80	142.1	221	163.1
Total destruction of sea wealth	17	118.1	58	130.0	184	126.2
Exploitation by owners	6	36.5	17	33.0	51	37.3
Entry of foreigners	10	103.3	68	118.0	161	117.8
Middlemen exploitation	11	54.0	24	49.1	92	65.5
Lack of preference to aged ones	2	26.5	12	36.9	79	45.9
Demands technical know how	2	7.0	4	14.9	15	9.3

Source : Survey data

The various problems associated with mechanisation in fishing industry pointed out by workers are analysed here. In the above table Kruskal Wallis test is used. It reveals that 10 workers from TNM sector with mean rank of 59 opined that mechanisation paved the way for entry of

more capitalists to fishing industry. The number of workers from TM and M sectors who responded to the same opinion are 33 and 98 with an average rank of 81.5 and 68.7 respectively. The comparison of the average ranks as per Kruskal Wallis test statistic is not significant. Hence the workers of TNM, TM and M have more or less same opinion about entry of more capitalists to fishing sector consequent to mechanisation. The same response was received with regard to the opinions like mechanisation paving the way for reduction in days of employment and reduction in prices for catches, but their opinion differ with regard to the opinion that mechanisation of fishing industry results in over exploitation of sea wealth. Here 18 workers from TNM sector with an average rank of 201.4 have such an opinion. The number of workers from TM and M sectors who responded to this opinion are 80 and 221 with an average rank of 142.1 and 163.1. The comparison of average ranks revealed that, the test statistic is significant. The difference among different sectors of workers, in respect of opinion regarding middle men exploitation increased, with regard to all other opinions like mechanisation which led to total destruction of sea wealth, exploitation of workers by vessel owners, lack of preference to aged ones for fishing operation, demand for technical knowhow for fishing and finally to the entry of foreigners to Indian sea, the workers of three different sectors having uniform opinion.

In order to test whether the opinions (which are insignificant as per KW test) of workers of the three sectors are correlated significantly, rank correlation matrix is used, the result is tabulated in table 7.4. and given below.

Table 7.4

Rank Correlation Matrix on Problems of Mechanisation in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.98**	1	
M	0.94**	0.96**	1

*Source : Survey data **Significant at 0.01 level*

The spearman's rho rank correlation between the rank order of TNM and TM about the problems of mechanisation to fishing industry is 0.98, which is significant at 0.01 level. It means that there is significant relation between the opinion of workers from TNM and TM. Similarly the rank correlation between TNM & M and TM & M are 0.94 and 0.96 respectively and these are significant at 0.01 level. Therefore, it can be generalized that the opinion of workers from the three different sectors are significantly correlated on the opinion in connection with the problems of mechanisation to fishing industry.

7.1.3 Trawling Ban

Trawling ban was implemented from 1988 along the coast of Kerala due to the severe crisis in the marine fishing sector. The crisis emerged as a result of mechanisation of fishing industry. This led to the unpleasant high competition in the sea, especially in the inshore areas and several conflicts between traditional sector fishermen and mechanised sector fishermen. The traditional fishermen attributed the decline in the marine fish production to the detrimental effects of trawling operation, especially during the monsoon season. In order to tackle these issues and for conserving the fishery resources, the State Government banned trawling during monsoon period. As a result in every year the mechanised boats are banned from operation for a period of 45 days during June, July months. There are divergent opinions regarding

trawling ban among different sectors of fishermen. Every year the trawling ban and its implementation even cause serious conflicts between fishworkers of different sectors. So, here an attempt is made to analyse the opinion of workers from different sectors regarding the present trawling ban. The opinions of fish workers of different sectors regarding replacement of present trawling ban is given in Table 7.5.

Table 7.5

Comparison of Mean Rank on Workers' Suggestions to Replace the Trawling Ban

Suggestions	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Change the months of ban	4	16.4	12	26.2	97	62.5
Restrict the number of vessels in operation	6	72.6	20	50.3	84	55.1
Assign time for operation in sea	2	39.0	21	52.4	85	55.6
Total banning on night trawlers	10	96.3	38	128.7	183	114.4
Ban overnight stay fishing operation	7	62.3	30	81.8	102	67.6
Restrict or ban foreign trawlers	10	156.7	48	155.1	192	116.7
Impose proper licensing system	8	127.0	47	107.8	156	104.8
Control the use of certain destructive gears	4	43.0	21	67.3	86	53.8

Source : Survey data

The comparison of rank positions of scores among different sectors of fishing on the suggestions to replace present trawling ban is presented

above. The Kruskal Wallis test is used by looking at differences in the ranked positions of scores in different groups. The ranks of opinions are converted in to scores from lowest to highest. The group that has the highest mean rank should have a greater number of high scores with in it.

From table 7.5, it can be understood that four workers from the TNM sector gave ranks to the opinion that the months of present trawling ban should be changed to replace the existing trawling ban with an average rank of 16.4. The number of workers from TM and M sectors who responded to the same opinion are 12 and 97 with average rank 26.2 and 62.5 respectively. When comparing the average ranks, the test statistic is significant. So the workers of TNM, TM and M differ in the opinion about changing the months of trawling ban for replacing the existing trawling ban. In respect of ban of foreign trawlers also, difference in the mean rank of the opinion among the workers in the three sectors is found to be statistically significant as shown by the test. In all other opinions like restricting the number of vessels in operation assigning specific time for fishing operation, complete banning of night trawling, banning the overnight stay fishing operation, imposing of proper and strict licensing system and control the use of destructive gears, the workers of the three sectors are having similar opinion. Yet the workers in all the three sectors are always not in favour of the destructive fishing operations.

The rank correlation of the rank order of the opinion based on the suggestions to replace the present trawling ban among workers of different fishing sectors are calculated and are given in table 7.6.

Table 7.6
Rank Correlation Matrix on Suggestions to Replace Trawling Ban in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.83*	1	
M	0.76*	0.76*	1

*Source : Survey data *Significant at 0.05 level*

The spearman's rank correlation between the rank order of TNM and TM about the suggestions to replace present trawling ban is 0.83, which is significant at 0.05 level. It means that there is significant relation between the opinion of workers from TNM and TM. Similarly the rank correlation between TNM & M and TM & M are 0.76 and 0.76 respectively and are significant at 0.05 level. Therefore, it can be concluded that the opinion of workers from all the three different sectors are significantly correlated on the suggestions to replace present trawling ban.

7.1.4 Reasons for Absence of a Steady Growth in Production and Export

When analysing the production and export from Kerala, both shows an unstable condition in growth. During the year 1990-91 the production of fish from Kerala was 514.2 thousand tonnes. It was raised to 524.8 thousand tonnes in 1991-92, and then decreased to 496.2 thousand tonnes. The figure for 2004-05 is 602.0 thousand tonnes. The compound growth rate (CGR) of production for the past 15 years is only 1.06. The annual growth rate (AGR) showed a diminishing trend during 1992-93, 1994-95, 1995-96, 1997-98, 2000-01 and in 2004-05. The export figures also show the same condition. The CGR for the past 15 years, regarding export is only 3.66. The AGR showed a diminishing trend during 1992-

93, 1997-98, 1998-99, 2000-01, 2001-02 and 2003-04. These figures are further analysed in this chapter and is shown in table 7.23. Here an attempt is made to analyse the reasons for absence of a steady growth in production and export. The comparison of rank positions of scores among the workers from different sectors of fishing with respect to various reasons for absence of a steady growth in production and export from Kerala are given in table 7.7. Kruskal Wallis Test is also used.

Table 7.7

Comparison of Mean Rank of Reasons for Absence of Steady Growth in Production and Export of Fish

Reasons	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Over exploitation of sea wealth	21	164.1	75	167.0	195	136.5
Invasion of foreign trawlers	21	170.8	92	196.1	266	186.3
Lack of demand in foreign markets	2	30.3	13	33.5	88	52.7
High cost of operation	4	35.1	32	55.9	83	47.2
Lack of harbours, processing centers etc	9	77.5	17	46.2	96	60.4
Lack of training to employees	1	7.5	3	7.5	12	8.5
Unscientific trawling ban	7	26.5	31	84.7	95	65.2
Lack of initiative from government	2	40.8	16	44.3	58	38.0
Exploitation by middlemen	7	55.8	19	57.3	81	53.5
Not able to maintain quality demanded by foreign countries	19	131.9	74	149.7	177	135.2
Restless operation of uncountable vessels	9	61.5	40	56.3	64	56.7

Source : Survey data

The various reasons for absence of a steady growth in production and export of fish from Kerala, stated by fish workers are analysed here. 21

workers from TNM sector with mean rank of 164.1 opined that, over exploitation of sea wealth is the main cause for absence of a steady growth in production and export of fish. The number of workers from TM and M sectors who responded to the same opinion are 75 and 195 with an average rank of 167 and 136.5 respectively. When comparing the average ranks, Kruskal Wallis test statistic is significant. i.e. the workers of TNM, TM and M differ in the opinion that, over exploitation of seawealth is the main cause for absence of a steady growth in production and export of fish from Kerala. Similarly with respect to opinions like lack of demand for our products in foreign markets, and unscientific trawling ban prevailing in the state, the opinion of workers of TNM, TM and M differ. In all other opinions, it is affirmed that invasion of foreign trawlers in Indian sea, high cost of operation of vessels lead to non-operation and non-production, lack of needed facilities like harbours, processing centres, lack of adequate training to employees, lack of initiative from government, exploitation by middlemen, inability to maintain quality standards prescribed by foreign countries and restless operation of uncountable vessels in our sea. The opinion of workers from the three sectors generally show the same trend.

The rank correlation of the rank order of those uniform opinion of workers on reasons for absence of a steady growth in production and export of marine products from workers of different fishing sector is given in table 7.8.

Table 7.8

Rank Correlation Matrix on Reasons for Absence of Steady Growth in Production and Export in Different Sectors

	TNM	TM	M
TNM	1		
TM	0.73*	1	
M	0.67*	0.86**	1

*Source : Survey data **Significant at 0.01 level *Significant at 0.05 level*

The spearman's rank correlation between the rank order of TNM and TM about the reasons for absence of a steady growth in production and export of marine products from Kerala is 0.73, which is significant at 0.05 level. It means that there is significant relation between the opinion of workers from TNM and TM. Similarly the rank correlation between TNM & M is 0.67, which is also significant at 0.05 level. The rank correlation between TM & M is 0.86, which is significant at 0.01 level. Therefore, it can be concluded that the workers from all the three different sectors are significantly correlated on the opinion regarding reasons for absence of a steady growth in the production and export of marine products from Kerala.

7.1.5 Suggestions to Improve the Fishing Industry

The workers' suggestions for improving the present position of fishing industry of different fishing sectors is examined. The comparison of rank positions of scores among the workers from different fishing sectors on suggestions to improve the present position of fishing industry in Kerala is given in Table 7.9.

Table 7.9

Suggestions for Improvement in Performance of the Industry

Suggestions for improvement	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Restrict the number of vessels	13	86.4	39	86.7	125	90.0
Enact proper registration and licensing	5	62.2	27	69.3	83	54.5
Ban or control the foreign trawlers	21	162.9	86	169.8	246	182.5
Assign different zones for different sector of fishermen	1	3.0	7	12.6	20	15.8
Fix a time schedule for operation in sea	10	78.6	48	95.9	151	101.5
Ban on night trawling and overnight fish trawling	21	160.6	76	163.9	224	164.4
Training to fishermen in modern operation	3	7.8	31	41.0	42	38.8
Restrict the entry of capitalists	10	70.7	24	70.5	115	76.0
Provide financial assistance by bank and other governmental agencies	13	101.7	56	127.6	169	119.1

Source : Survey data

From the table 7.9 it is ascertained that 13 workers from TNM sector with a mean rank of 86.4 suggested to restrict number of vessels in operation in our sea. The number of workers from TM and M sectors responded to the same suggestion are 39 and 125 with an average rank 86.7 and 90 respectively. For comparing the average ranks, KW test is applied and found that it is significant. It means that the workers of TNM, TM and M have more or less the same opinion about the need to restrict the number of vessels in operation. With regard to other suggestions except that, proper training should be given to fishermen in modern operations, the workers have uniform opinion. In the case of suggestion regarding need to impart training to fishermen on modern operations, there are only three workers from TNM sector with an

average rank of 7.8. The number of workers from TM and M sectors who responded to the same opinion are 31 and 42 with average rank 41 and 38.8 and is found that the KW test statistic is significant. It means that the workers of TNM, TM and M differ in the suggestion regarding need for imparting training. As stated earlier in all other suggestions viz.,

Need for implementing proper registration and licensing system to fishing vessels.

Ban or restrictions for the operation of foreign trawlers in Indian sea,

Fixing of a time schedule for operation in the sea.

Ban on night trawling and overnight stay fishing

Restriction of entry of capitalists to fishing sector

Need to provide financial assistance from banks and government, and

Assigning different zones for operation of different sector of fishermen, the workers from three fishing sectors are having more or less the same opinion. But only a very few favoured assigning special zones to different sectors of fishermen, as they stated it is impracticable.

To test whether the different suggestions given by the workers of the three fishing sectors are correlated significantly, rank correlation of the mean ranks is calculated and presented in table 7.10.

Table 7.10

Rank Correlation Matrix on Suggestions to Improve the Performance in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.98**	1	
M	0.98**	1**	1

*Source : Survey data **Significant at 0.01 level*

Spearman's rank correlation between the rank order of TNM and TM about the suggestions to improve fishing industry in Kerala is 0.98, which is significant at 0.01 level. It means that there is significant relation between the opinion of workers from TNM and TM. Similarly the rank correlation between TNM & M and TM & M are 0.98 and 1 respectively and those are significant at 0.01 level. Therefore, it can be concluded that the suggestions of workers from the three different sectors are significantly correlated on the suggestions for improvement of the present position of fishing industry in Kerala.

7.2 Vessel Owners' Views on Prospects and Problems of Mechanisation

Owners are playing an important role in the growth and development of mechanised fishing industry. They are the contributors of capital and ultimately they will be the gainers or loosers of the industry. Here an attempt has been made to analyse the views of owners, regarding the problems and prospects of the industry. To study their views the following parameters are used.

a. accessibility to modern equipments
b. owners' views on prospects of mechanisation
c. owners' views on problems of mechanisation
d. owners' views on trawling ban
e. owners' views on effect of operation of foreign vessels in our sea
f. owners' views regarding reasons for absence of a steady growth in production and export of fish and
g. owners' views on deep sea fishing policy of the government.

7.2.1 Accessibility to Modern Equipments

The fishing industry improved a lot due to mechanisation. Nowadays the most modern equipments are being used in the mechanised vessels

to find the availability of fish on a particular fishing ground and even to find the route from a fishing ground to the harbour. In almost all the mechanised crafts, and in certain motorised crafts, these kind of equipments are present. The table 7.11 shows the availability of modern equipments like sonar, echo-sounder, path finder, wireless/mobile phone and ice box / cold storage.

Table 7.11

Distribution of Fishing Vessels Having Modern Equipments

Modern equipments	TNM	TM	M
Sonar	0(0)	0(0)	42(59.2)
Echo sounder	0(0)	1(2.5)	53(74.6)
Path finder	0(0)	1(2.5)	40(56.3)
Wireless/Mobile	0(0)	23(57.5)	69(97.2)
Ice box/Cold storage	0(0)	2(5.0)	53(74.6)

Source : Survey data Figures in brackets indicate percentage.

The above table reveals that the TNM sector does not have any modern facility/equipment for fishing. The wireless/mobile phones are used by 57.5% TM vessels and 97.2% M vessels. With regard to other facilities mechanised vessels are advancing than TM vessels. A meagre percent is present among TM vessels because of the fact that inboard engine fitted crafts in operation are using them. The use of these facilities will automatically lead to the development of the industry as a whole. For analyzing the changes that are being taking place in fishing industry in Kerala due to mechanisation, it is better to know the opinions of owners from different fishing sectors. An attempt is made to present the views of vessel owners on the prospects of fishing industry on account of mechanisation.

7.2.2 Prospects of Mechanisation

The comparison of rank positions of scores among the owners from different sectors of fishing on the prospects of fishing industry on account of mechanisation is given in Table 7.12.

Table 7.12
Owners' Views on the Prospects of Post Mechanised Fishing Industry

Reasons	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Increase in production	8	33.8	26	35.6	46	44.4
Increase in earnings	9	36.1	26	44.2	46	40.2
Increase in exports	9	22.9	10	27.9	33	27.1
Able to catch more varieties of species	8	36.8	14	28.9	41	32.1
Attracted people from other industries	5	15.7	10	14.2	23	22.6
More consumption	4	16.3	5	10.2	15	12.3
Reduction in manual effort	15	67.1	29	59.3	57	42.6
Competitive prices for catches	3	3.8	4	5.3	4	8.4

Source : Survey data

Eight owners having mean rank 33.8 from the traditional non-motorised fishing sector opined that the production increased due to mechanisation in fishing industry. The number of owners from TM and M sectors responded towards the same opinion are 26 and 46 with average rank 35.6 and 44.4 respectively. When comparing the average ranks, KW test statistic is insignificant. It means that the owners of TNM, TM and M have more or less same opinion about the increase in production due to mechanisation of fishing industry. Similarly the opinion of owners from TNM, TM and M are more or less same in respect of the opinion that

mechanisation paved the way for increase in earnings, increase in exports, generating ability to catch more varieties of species, attracting people from other industries, resulting in more consumption of fish and generating competitive prices for catches. At the same, in the opinion regarding mechanisation results in reduction of manual efforts, the owners of the three sectors differ. With regard to that 15 owners from TNM gave ranks to the opinion with an average rank of 67.1. The number of owners from TM and M sectors who responded towards the same opinion are 29 and 57 with average rank 59.3 and 42.6 respectively. When comparing the average ranks, test statistic is significant. It means that the owners of TNM, TM and M differ in the opinion about reduction in manual efforts due to mechanisation.

The rank correlation of the opinion on the prospects of fishing industry among owners of different fishing sectors are calculated and are given in Table 7.13.

Table 7.13

Rank Correlation Matrix on Prospects of Mechanisation in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.9**	1	
M	0.81*	0.93**	1

*Source : Survey data **Significant at 0.01 level *Significant at 0.05 level*

The spearman's rank correlation between the rank order of TNM and TM owners about the prospects of fishing industry due to mechanisation is 0.9, which is significant at 0.01 level. It means that there is significant relation between the opinion of owners from TNM & TM. Similarly the rank correlation between TNM and M and TM & M are 0.81 and 0.93 respectively. The correlation between TNM & M is significant at 0.05

level and between TM & M is significant at 0.01 level. Therefore, it can be concluded that the opinion of owners from all the three different sectors are significantly correlated on the opinions regarding the prospects of fishing industry resulting from mechanisation.

7.2.3 Problems of Mechanisation

The various problems related to mechanisation of fishing industry as pointed out by owners of different fishing sectors are analysed. The comparison of rank positions of scores among the different sectors of fishing on the problems of mechanisation is given in table 7.14.

Table 7.14
Comparison of Mean Rank of Owners' Views on Problems of Mechanisation

Problems	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Deterioration of marine wealth	17	45.3	15	44.4	42	31.9
Entry of foreigners	15	45.3	32	62.5	62	53.5
Reduction in prices of catches	12	34.0	29	45.7	35	37.6
Unhealthy competition	8	15.1	7	14.9	20	20.9
Middlemen exploitation	5	11.8	14	13.5	13	15.8
Lack of proper facilities	6	18.8	7	13.1	22	17.5
Heavy operational costs	13	37.8	31	48.8	61	52.0
Heavy repairs and maintenance	10	29.0	20	39.2	53	42.3

Source : Survey data

Table 7.14 reveals that 17 owners from TNM sector with a mean rank 45.3 were of the opinion that the mechanisation in fishing causes deterioration of marine wealth. 15 vessel owners from TM and 42 vessel owners from M responded to the same opinion with an average rank of 44.4 and 31.9 respectively. When comparing the average ranks, the test statistic is found significant. So, the owners of TNM, TM and M differ

in the opinion that mechanisation of fishing causes deterioration of marine wealth.

Such a difference in opinion, based on the test statistic, is found among the owners of three fishing sectors regarding, middle men exploitation in fishing due to mechanisation and it causes increase in operational cost. In all other opinions like, mechanisation of fishing attract the entry of foreigners, the opinion of owners of different sectors are having same opinion. With regard to the opinion that, mechanisation of fishing causes entry of foreigners, 17 owners from TNM, 32 from TM and 62 from M responded with average ranks 45.3, 62.5 and 53.5 respectively and the test statistic is insignificant, so the vessel owners of TNM, TM and M have more or less same opinion about the entry of foreigners. The same uniformity in opinion is found in the case of opinions like:

- Mechanisation causes reduction in prices of catches
- Mechanisation paves the way for unhealthy competition between different sectors
- Mechanisation causes losses to owners due to heavy repairs and maintenance and
- Lack of facilities for fish landing and processing.

The rank correlation matrix of the rank order of the opinion on the problems of mechanisation in fishing industry as pointed out by owners of different fishing sectors are given in table 7.15.

Table 7.15

Rank Correlation Matrix on Problems of Mechanisation in Different Fishing Sectors

	TNM	**TM**	**M**
TNM	1		
TM	0.86**	1	
M	0.69	0.88**	1

*Source : Survey data **Significant at 0.01 level*

The spearman's rank correlation between the rank order of TNM and TM about the problems of mechanisation in fishing industry in 0.86, which is significant 0.01 level. It means that there is significant relation between the opinion of owners from TNM and TM. When we look into the rank correlation between TNM & M it is 0.69 and is insignificant. This is the evidence of difference in the opinion of owners from TNM and M regarding the problem of mechanisation. The traditional sector always claim that the mechanisation of fishing industry causes serious damages to the sea and to the fishing industry in general. The mechanised vessel owners on the other hand do not accept the views of traditional fishing community, though they accept certain points of arguments which are proved by scientists. The rank correlation between TM & M is 0.88, is also significant at 0.01 level. So there also exists a significant relation between the opinion of owners from TNM and TM. This association may be because, a certain number of TM fishermen are now operating almost in similar manner as that of the mechanised fishermen operates.

7.2.4 Trawling Ban

Trawling ban as stated earlier paved the way for serious conflicts among fishermen of different sectors. It even caused serious damages to fishing vessels. The boat owners of M sector are of the view that though the trawl ban was introduced 12 years ago with the aim of preserving marine wealth, it was generally observed that the monsoon season was the spawning season for fish and that no conclusion had been reached regarding the ban on trawling had helped augment marine wealth in the Kerala coast. Expressing their own traditional awareness of sea and quoting scientific documents, they are of the view that the period of November to January is the spawning time for most fish species in the Kerala waters and hence they consider this period as the most appropriate time for trawling ban. While traditional fishermen agencies demand strict enforcement of trawling ban and the extension of present

ban period to 90 days or atleast 65 days. In view of this owners from different sectors responded to total ban during monsoon period and their opinions on the present ban are shown in tables 7.16 & 7.17 respectively.

Table 7.16

Owners Opinion about Total Ban during Monsoon Period

Opinion	TNM	TM	M
Favouring total ban	5(27.8)	11(27.5)	57(80.3)
Not favouring total ban	13(72.2)	29(72.5)	14(19.7)

Source : Survey data Note : Figures in brackets indicate percentage

Among the vessel owners from TNM & TM a vast majority do not support the total ban during monsoon period, because it may lead to poverty among the fishermen households. They also pointed that the fishing operation will not cause any destruction to sea. In the mean time a small group from TNM & TM owners favour total ban and they are of the opinion that government should provide necessary assistance during ban period to fishermen community and the total ban will help to increase the sea wealth. 80.3% of mechanised vessel owners favour total ban, because one of their demands regarding trawling ban during monsoon itself is to ban all vessels if the ban is imposed. The owners of the same fishing sector stand divided on total trawling ban. However it may be useful to know their views about the trawling ban prevailing at present. The results obtained from the owners of the three fishing sectors is presented in table 7.17.

Table 7.17

Distribution of Owners' Views on the Present Trawling Ban

Opinion	TNM	TM	M
Need to extend to 90 days	11(61.1)	21(52.5)	3(4.2)
Change the month of trawling ban	1(5.6)	0(0)	22(31.0)

Present ban is unscientific, to be stopped	0(0)	0(0)	7(9.9)
Total holiday to sea is needed	3(16.7)	5(12.5)	43(60.6)
No ban is needed, only restrictions are enough	2(11.1)	3(7.5)	4(5.6)
Others	2(11.1)	11(27.5)	3(4.2)
Total	19(100)	40(100)	82(100)

Source : Survey data Note : Figures in brackets indicate percentage.

Most of the vessel owners from TNM (61.1%) and TM (52.5%) are demanding to extend the days of monsoon trawling ban to 90 days, and none spoke against the unscientific effects of the ban. Majority of the mechanised sector owners demand total holiday to sea including banning of TNM vessels, TM vessels and foreign vessels in operation in the sea. 31% of mechanised sector owners demand change in the months of trawling ban. Some vessel owners from all the three sectors expressed other opinions like, ban foreign trawlers, fix time schedule for operation and even banning of mechanised vessels for 2 or 3 years in our sea.

7.2.5 Operation of Foreign Trawlers

The mechanised sector along with traditional sector fishermen group argue that the operation of foreign trawlers in our sea causing serious damages to our sea. In this circumstance, the opinion of vessel owners regarding the effect of the entry of foreign vessels into our fishing industry is examined and the result is presented in Table 7.18.

Table 7.18

Owners Opinions on the Effect of Foreign Trawlers Operating in Our Sea

Opinion	TNM	TM	M
Favourable	0(0)	0(0)	1(1.4)
Unfavourable	18(100)	38(95)	69(97.2)
No effect	0(0)	2(5)	1(1.4)

Source : Survey data Note : Figures in brackets indicate percentage.

All the sample vessel owners from the TNM sector state that the operation of foreign vessels in our sea is harmful to the industry. The opinion is almost same among TM (95%) and M (97.2%) vessel owners also. So almost all those vessel owners who are actively engaged in fishing in Kerala are against the operation of foreign fishing vessels in our sea. The foreign vessels began to operate in our sea as a policy regarding deep sea fishing by Government of India.

7.2.6 Deep Sea Fishing Policy of the Government

The owners' of the fishing industry is keeping a close watch on the policy of government towards the fishing industry of the state. The opinion of owners regarding the effectiveness of deep sea fishing policy of the government is presented in table 7.19.

Table 7.19
Vessel Owners Opinion on the Effectiveness of Deep Sea Fishing Policy

Opinion	TNM	TM	M
Very effective	0(0)	0(0)	3(4.2)
Effective	3(16.7)	1(2.5)	3(4.2)
Not effective	4(22.2)	10(25.0)	14(19.7)
Defective	7(38.9)	23(57.5)	32(45.1)
No opinion	4(22.2)	6(15.0)	19(26.8)

Source : Survey data Note : Figures in brackets indicate percentage.

From table 7.19 it is clear that majority of the owners from all fishing sectors portray the deep sea fishing policy of the government as a defective one and not effective as it should. Only a very few consider it as effective and even 4.2% from mechanised sector states it as very effective. This is because there is no restriction in deep fishing by trawlers above 40 feet even by staying at night in the sea. The policy of

government towards fishing industry and its impact expressed by the owners is presented in table 7.20.

Table 7.20

Opinions on Government Policy in the Development of Fishing Industry

Opinion	TNM	TM	M
Good	1(5.6)	4(10.0)	0(0)
Not good	17(94.4)	36(90.0)	71(100)

Source : Survey data Note : Figures in brackets indicate percentage.

There is uniformity in opinion regarding the government's policy towards the fishing industry. 100% owners from M sector, 90% from TM sector and 94.4% from TNM sector agree with the fact that government ignores the development of fishing sector. 10% of TM sector and 5.6% of TNM sector state that government is interested in developing the industry, because certain financial assistance were provided to them through Matsyafed and other fishermen co-operatives, but these assistances are not provided to the mechanised sector owners.

7.2.7 Reasons for Absence of a Steady Growth in Production and Export

The comparison of rank positions of scores among the owners from different sectors of fishing for various reasons for absence of a steady growth in production and export of fish from Kerala is examined, the result of the same is given in table 7.21. The various reasons for absence of a steady growth in production and export of fish from Kerala as stated by owners of different fishing sectors are analysed here.

Table 7.21
Comparison of Mean Rank of Reasons for Absence of a Steady Growth in Production and Export of Fish

Reasons	TNM		TM		M	
	No.	Mean Rank	No.	Mean Rank	No.	Mean Rank
Unscientific trawling ban	5	12.1	5	16.6	35	25.5
Restless operation of vessels	16	52.9	31	52.5	46	41.2
Invasion of foreign trawlers	18	50.8	36	70.2	67	58.8
Reduction in prices of sea food items	10	25.1	15	28.0	37	34.4
Lack of facilities for good processing	9	20.6	10	25.5	26	22.9
Lack of government support	12	41.0	20	32.3	44	40.0
Heavy restrictions imposed by government	4	7.3	4	7.3	8	9.3

Source : Survey data

The mean rank is 12.1 for five owners from the TNM sector towards the opinion that the trawling ban is unscientific. The number of vessel owners from TM and M sector who responded to the same opinion are five and 35 with average ranks 16.6 and 25.5 respectively. When comparing the average ranks, Kruskal Wallis test statistic is used and found the readings as significant. Therefore, the vessel owners of TNM, TM and M differ in the opinion that, unscientific trawling ban during monsoon season is a reason for absence of a steady growth in production and export. It is quite natural that most of the vessel owners from TNM and TM disagree with the opinion that the present ban is unscientific and argued it as a reason for decline in production.

In all other opinions the vessel owners from the three sectors of fishing show uniformity, with regard to the opinion like, restless operation of fishing vessels in our sea as reason for absence of a steady growth in production and export. 16 vessel owners from TNM with an average rank of 52.9, 31 from TM with an average rank of 52.5 and 46 from M

with 41.2 average rank expressed same opinion, while comparing the average ranks, the test statistic was found to be insignificant and their opinions were almost the same. In the case of opinion regarding, invasion of foreign trawlers as a reason for absence of a steady growth in production and distribution, the same opinions are expressed by 18 TNM sector owners, 36 TM sector owners and 67 M sector owners, with average ranks 50.8, 70.2 and 58.8 respectively. Readings reveal that the test statistic is found insignificant such that an agreement in opinions regarding restless operation of countless vessels and invasion of foreign trawlers, is also present in other opinions to be precise.

Reduction in prices of sea food items

Lack of proper facilities for processing

Lack of government support and

Heavy restrictions imposed by government.

To test whether the uniformity in the opinion about the absence of a steady growth in production and export as expressed by the owners of the three fishing sectors is significant or not, rank correlation matrix is used and the result of the same is presented in table 7.22.

Table 7.22

Rank Correlation Matrix on Reasons for Absence of a Steady Growth in Production and Export in Different Fishing Sectors

	TNM	TM	M
TNM	1		
TM	0.96**	1	
M	0.93**	0.96**	1

*Source : Survey data **Significant at 0.01 level*

The spearman's rank correlation between the rank order of TNM and TM is 0.96, which is significant at 0.01 level. It means that there is significant relation between the opinion of owners from TNM and TM.

Similarly the rank correlation between TNM & M and TM & M are 0.93 and 0.96 respectively, which is also significant at 0.01 level. Hence it can be inferred that the opinion of owners from all the three different sectors are significantly correlated on the opinion regarding reasons for absence of a steady growth in the production and export of marine products from Kerala.

7.3 Analysis of Production and Export

For the Analysis of the prospects of mechanised fishing industry in Kerala, an attempt is made to analyse the available secondary data regarding fish production and export from Kerala. The two variables selected for the analysis are

a. fish production over 15 years and
b. fish exports over 15 years.

The table 7.23 exhibits the production and export of fishing industry from 1990-91 to 2004-05. The table also states the annual growth rate for both production and exports. The compound growth rate, percentage share of export to production and a trend projection are also done and shown in the table.

Table 7.23
Distribution of Production and Export in Fish from Kerala
Quantity in thousand tonnes

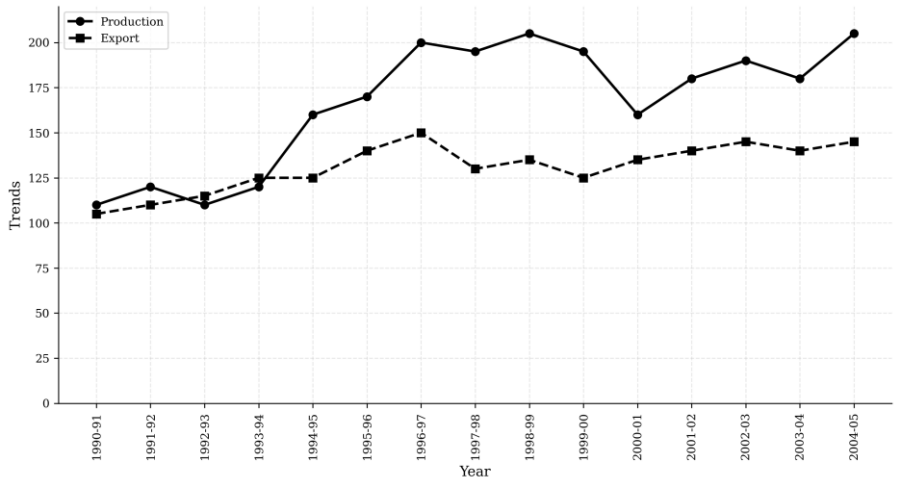
Year	Production			Export		
	Quantity	AGR	Trend	Quantity	AGR	Trend
1990 - 91	514.2	--	100.0	51.0	--	100.0
1991 - 92	524.8	2.1	102.1	58.7	15.2	115.2
1992 - 93	496.2	-5.4	96.5	49.1	-16.4	96.3
1993 - 94	559.2	12.7	108.8	63.8	30.1	125.1
1994 - 95	548.4	-1.9	106.7	74.7	16.9	146.5
1995 - 96	532.6	-2.9	103.6	78.9	5.7	154.7
1996 - 97	660.9	24.1	128.5	92.3	17.0	181.0

1997 - 98	511.1	-22.7	99.4	89.4	-3.2	175.3
1998 - 99	582.0	13.9	113.2	70.6	-21.0	138.4
1999 - 00	594.0	2.1	115.5	92.1	30.4	180.6
2000 - 01	567.0	-4.5	110.3	88.9	-3.6	174.3
2001 - 02	594.0	4.8	115.5	72.8	-18.1	142.7
2002 - 03	603.0	1.5	117.3	81.4	11.9	159.6
2003 - 04	609.0	1.0	118.4	76.6	-5.9	150.2
2004 - 05	602.0	-1.1	117.1	87.4	14.0	171.4
CGR	1.06			3.66		

Source : Compiled and computed from Economic Review 2005 and Facts & Figures 2000, Department of Fisheries, Govt. of Kerala, 2001.

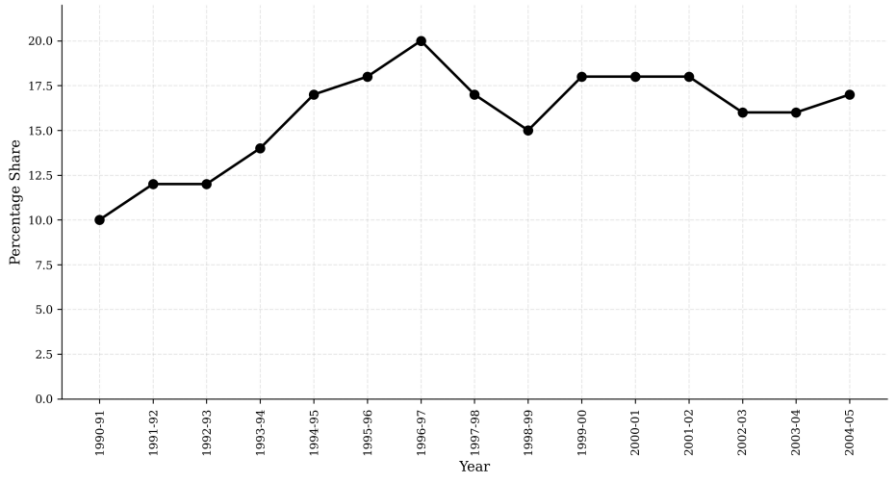
The table states that the CGR of production of marine products in Kerala over a period of 15 years recorded only a growth rate of 1.06, which is not at all encouraging. The annual growth rate exhibits a fluctuating tendency during the period of analysis. Growth and decline were seen throughout the period of analysis. While looking on to the trend of production it was read that no such huge growth is present. In the case of export, the compound growth rate is 3.66 over the last 15 years. Here also the annual growth rate exhibits the same trend as that in the case of production. Naturally the trend of export showed a growth upto 171.3 in 2004-05. The percentage share of export on production revealed that on an average 15% of our fish production is currently exported. The distribution of production and export of fish from Kerala is graphically represented in Figure 5.

Figure 5
Trend of Production and Export of Fish from Kerala



The distribution of percentage share of export to production is graphically represented in Figure 6.

Figure 6
Percentage Share of Export to Production



Testing of Hypotheses

Hypothesis 5

The fifth hypothesis formulated earlier was that, workers of different fishing sectors do not differ significantly on the prospects of mechanisation. The analysis in this respect was given in table 7.2. The

rank correlation between the rank order of TNM & TM, TNM & M and TM & M is found statistically significant at 0.01 level. It means that there is a statistically significant relation between the opinion of workers from deferent fishing sectors. Hence we accept the hypothesis.

Hypothesis 6

The sixth and the last hypothesis as formulated earlier was that the owners of different fishing sector do not differ significantly on the reasons for absence of a steady growth in production and export of fish in the post mechanised period. As revealed by the analysis in table 7.22, the spearman rank correlation among the rank order of TNM & TM, TNM & M and TM & M is found statistically significant. Accordingly, there is a significant relation between the opinion owners from different sectors regarding the reason for absence of a steady growth in the production and export of marine products from Kerala in the post mechanised period. Therefore, the hypothesis is accepted.

Conclusion

The workers irrespective of sector are uniform in their opinion on the prospects and problems of the post mechanised fishing industry. The mechanised sector continues to attract youngsters to this field more than the other sectors. Nevertheless they pointed out serious defects like entry of people from outside the fishing community, loss in days of employment due to the huge cost of operation during the off season period, destruction of seawealth and underpricing of catch brought ashore.

The owners of three fishing sectors are also uniform with regard to the prospects of the mechanised fishing sector. The fact that, this sector was able to attract investment from people outside the fishing community is clear evidence of the advantage it could gain over the other sectors. Nevertheless the owners of the traditional fishing vessels and

mechanised fishing vessels disagree on key issues like the imposing of trawling ban during monsoon period.

It is worthwhile to note that during the past fifteen years there has not been substantial increase in the production and growth of exports. The nominal increase recorded as per the statistics available is low and not stable.

CHAPTER VIII

SUMMARY, CONCLUSIONS AND FUTURE DIRECTIONS

Summary of Findings and Recommendations

The plight of fishermen in recent times has been of much concern to the state, economy and livelihood of many at large. The present study is focused on the mechanization of fishing industry and its impact on workers and owners of the vessels. The changes brought about by mechanisation drifted, the once single community into two separate classes, the traditional fishermen and mechanised fishermen. With the motorisation of country crafts in 1980s, the traditional group was further divided into the traditional non-motorised sector and the traditional motorised sector. Thus, in this study the fishermen are classified into three categories to identify the impact of the mechanisation process in Kerala.

Though there have been many studies on the fishermen in Kerala, the focus of these studies have been primarily on the conditions, problems and needs of the traditional fishermen. The picture of the fishermen in the mechanised fishing sector has always remained out of the scope of earlier studies. Besides, the Government has always considered the traditional fishermen, the fishermen in the mechanised fishing sector and the owners of the vessel on an equal plane. This is a glaring error, as the major share of government's grants in developing the social status of the ordinary fishermen have been usurped mostly by the minority of investors who have recently entered the field. Therefore, to project the exact conditions of fishermen in the industry, they are primarily classified in this study as the traditional non-motorised fishermen, traditional motorised fishermen and mechanised fishermen. Within each of these divisions owners and workers are grouped separately. An attempt at looking into the conditions of fishermen due to the impact of mechanization, based on such a broad classification is a new initiative. Hence the relevance of this study.

Objectives of the Study

The broad objective of the study is to analyse the impact of mechanization process in fishing industry in Kerala. However the following are the specific objectives of the study:-

1. To analyse the process of mechanisation of fishing industry in Kerala.
2. To study the impact of mechanisation of fishing industry on fish workers.
3. To study the impact of mechanisation on owners of vessels.
4. To analyse the rate of return of vessel owners of the fishing industry, and
5. To study the problems and prospects of mechanised fishing industry.

The present study is an empirical one based on survey method. It used both primary and secondary data. The primary data were collected from fish workers and fishing vessel owners of three different fishing sectors: traditional non motorised sector, traditional motorised sector and mechanised sector. For collection of data two different interview schedules were developed after making a pilot study in the southern region. In addition, for gaining more information regarding fishing sector, discussions were made with MPEDA executives, fisheries department officials, fish exporting company executives, trade union leaders and other experts related to the industry. For selection of respondents a multi-stage random sampling technique was used. In the first stage, universe of the study is divided into three fishing regions: Southern region (Kollam, Thiruvananthapuram and Alappuzha districts), Central region (Ernakulam, and Thrissur districts), and the Northern region (Malappuram, Kozhikode, Kannur and Kasargode districts).

From the three regions a total of 402 workers and 129 vessel owners were selected on a random basis. The secondary data were collected from various publications of State Planning Board, Department of fisheries, Marine Products Export Development Authority, Central Marine Fisheries Research Institute, Centre for Developmental Studies, South Indian Federation of Fishermen Societies, Matsyafed, Programme for Community Organisation etc.

The primary data collected were edited, classified and analysed with the help of computer by using SPSS keeping in view the objectives of the study. For analysis of data mathematical tools like averages, ratios and percentages, statistical tools like Chi-square test, Analysis of variance, Scheffe multiple comparisons, Rank correlation, Kruskal Walllis test, t-test, Z-test and Mann-Whitney U test were used.

In chapter two, "Review of Literature" it was observed that the focus of earlier studies have been primarily on the conditions, problems and needs of traditional fishermen. The picture of the fishermen in the mechanised fishing sector has always remained outside the purview of earlier studies. Besides the Government never made an attempt to segregate the fishermen into workers and owners of vessels, and as fishermen belonging to traditional non-motorised sector, traditional motorised sector and mechanised sector. It was found that such a classification is inevitable for measuring the impact of mechanisation among fishermen.

Chapter three titled, "The fishing industry - an overview" provides a comprehensive history of fishing, age old fishing practices, and the fishing industry and its importance. The chapter focused on the fishing industry with special regard to Kerala clearly concludes that the manifold contributions of the industry has given the industry a dominant position in the Indian economy. Primarily the industry has provided employment opportunities, it has also been an important earner of

foreign exchange by export and has been an inevitable food product by providing cheap animal protein to the masses.

A survey of the statistical data given in chapter three clearly show that there has been tremendous development in the fishing industry since the mechanisation of the fishing vessels. Nevertheless the same data is conclusive in pointing out that there is ample scope for further enhancing the development potential of the industry, with proper restrictive measures. Scientifically it is acknowledged that the deep sea resource potential of Kerala remains under exploited.

Chapter four is on "the mechanisation of the fishing industry in Kerala". The mechanisation process that has taken place in Kerala is explored here in detail. Not withstanding, the chapter begins with the types of country crafts and vessels used for fishing prior to the process of mechanisation. This is done to give a clear view of the fishing scene during the period. The main contributors to the mechanisation programme were the INP and the five year plans of the Government of India. The INP and its programmes were the foundations of the mechanisation programme. Later changes brought about by the Five Year Plans which had taken over the mechanisation programme are also viewed in detail. An overview of the mechanisation programme shows that the success of the mechanisation programme were on expected lines in the initial stages of its implementation. This was primarily due to the strict monitoring and scientific studies by the implementing agencies. However rampant mechanisation and motorisation and flawed monitoring later led to the crisises that the industry faces today.

The chapter five "Impact of mechanisation on fish workers", analysed the data obtained from fish workers of different fishing regions and sectors. The variables used for studying the impact of mechanisation of fishing industry on fish workers are socio-demographic conditions of workers, activities of womenfolk among fishers, ancestral occupation or

traditionality of fishing operation, social life index of fish workers, income of workers during season, income of workers during offseason, savings of workers, and liability of workers.

The chapter six, "Impact of mechanisation on fishing vessel owners"- analysed the data obtained from owners of different fishing sectors and regions. For examining the impact of mechanisation on owners, the variables used are socio-demographic conditions, ancestral occupation or traditionality of fishing operation, social life index, income of owners during catchment season, income of owners during off-season, operating cost of vessels, savings of owners during catchment season, liabilities of owners and return on investment of owners.

The chapter seven, "Problems and prospects of mechanised fishing industry" analysed the defects and potentials of fishing industry due to mechanisation in three different dimensions viz., the views of workers, the views of owners of vessels and the data regarding production and export of the industry over the last 15 years.

To analyse the views of workers, the parameters used are workers views on prospects of mechanisation, problems of mechanisation, trawling ban, reasons for absence of a steady growth in fish production and exports and suggestions to improve the industry.

Vessel owners play an important role in the growth and development of mechanised fishing industry. To study the views of owners, the variables used are views on prospects of mechanisation, problems of mechanisation, trawling ban, effect of operation of foreign vessels in our sea, reasons for absence of a steady growth in fish production and exports, and on deep sea fishing policy of the government.

The major findings emerged from the study may be summarised as follows:

1. Impact of mechanisation on fish workers

1.1 With regard to socio demographic conditions of workers the analysis of religion and caste showed that not only people from the traditional fishing castes were attracted to the mechanised sector but also people from other communities. With respect to age the findings indicate that the mechanised sector attracts more youngsters to the fishing industry. The analysis of the level of education of workers shows that the workers in the M sector and TM sector are more educated than their counterparts in the TNM sector. Observing the size of the family, it is found that workers in the M sector and the TM sector prefer the small family system than the workers in the TNM sector.

1.2 With regard to the activities of women folk among fish workers, it is quite interesting to see that the majority of the marine fishermen households do not having womenfolk working in the fishing industry. The minority who work in the field are engaged in peeling shed work and fish vending. The attitude of marine fishermen regarding the work of womenfolk has changed a lot.

1.3 Fishing is considered to be a traditional occupation, with mechanisation, others too entered the field. So an attempt was made to analyse the traditionality of this occupation. It was found that the traditionality of the occupation persisted eventhough there are new entrants. Further it revealed that the TNM sector operations have started to disappear from Kerala coast; at present only a few fishermen are operating in traditional lines and most of them are aged ones. Many youngsters prefer employment either in TM or M sector. This reveals a shift from traditional fishing sector to modern fishing operations.

1.4 The social life index of mechanised fishermen's group showed a clear rise in southern region than in the other two regions. The

attempt to find the difference between SLI of different groups shifting from one sector to another also revealed that there is a significant change in the social life pattern in accordance with the shift in operation from the traditional sector to the mechanised sector.

1.5 With regard to income of the workers during catchment season, it revealed that the mechanised fish workers possess more income in season than their counterparts in TM and TNM sectors. Further, the mean income of M sector workers in southern region is higher than other two regions, because of higher percentage of share offered to workers in the southern region. The M sector workers earn more income than others because of the assured income factor, i.e., 'bata' given to them even if there is no catch at all, and the limit in number of workers. When the income earned during catchment season by workers were compared in accordance with shift in operating sector, it is found that the mean income of fish workers increase in accordance with the shift in operational sector. The shift to mechanised sector increases the mean income of the worker impressively. This proves that there is a positive impact by the mechanisation in respect of income earning capacity of the fish worker.

1.6 While comparing the income of fish workers during the off-season period it was found that the M sector workers had higher mean income than others. Through the analysis it was found that, irrespective of the region there is significant difference between off-season income of workers belonging to different sectors. With regard to shift in fishing sector it was noted that the workers who shifted to M sector have higher income than those who stick on to TM and TNM sectors. These facts reveal that the process of mechanisation enabled the workers to raise their level of income during season and off-season periods.

1.7 The fisherfolk are known to be spend thrift-people, who were not concerned about savings for future. Has mechanisation changed their attitude towards savings? This view was measured and the results obtained reveal that a huge variation exists on the amount of savings among workers belonging to the same sector and same region. Thus ample evidence to the fact that attitude towards savings is not common among the workers. In the south the variation in savings pattern of mechanised workers is very high and those who saved enough even become owners of vessels. The savings of workers in the TNM sector of different regions were found to differ significantly. This is mainly because of the organised activities of fishermen societies, and other agencies working on their behalf, especially in central region. As regard the other aspect it was noted that the shift in fishing sector, from traditional line to modern lines increased the earning capacity as well as savings of workers.

1.8 The liability of fishworkers of different fishing sectors were analysed and noticed that almost 50 to 65% of the workers from each sector have liability. It is clear that liability accounts for shift of the workers from one sector to the other. The major observation is that there is a huge margin of difference in liability among groups having liability. In the group of mechanised workers only those from southern and central regions differs significantly with regard to liability. There is no significant association between shift in occupation, and liability. So whatever may be the operating sector, the position of liability is same among the fish workers. Therefore the mechanisation process in fishing sector has no influence over the liability of workers of the marine fishing community.

2. Impact of mechanisation on fishing vessel owners

2.1 Analysis of the socio demographic conditions of owners show that many youngsters were attracted by the mechanised fishing industry. The level of education of owners in the M sector is also higher then their counterparts in the TNM sector and TM sectors. Considering the size of the family one can find that the small family system prevails more in the M sector than in others. Mechanisation process also brought about a shift of residence from rural to urban areas. The landholdings of M sector vessel owners are also comparatively better than others.

2.2 A major criticism against mechanisation from among the fishermen community is the invasion of capitalists with high profit motive to the field of fishing. In this background the ancestral occupation of owners was examined. From the analysis it was found that traditionality of occupation persists and only a small group of investors have entered the fishing sector, other than fishermen. When the occupation of children of owners were analysed, it was found that only a very small group stick on to fishing sector. In the southern region no children from the owner's family are engaged in fishing. Again, the sector wise analysis revealed that the small group of children of vessel owners who stick on to fishing operation belong to either M or TM sector. So it is clear that mechanisation changed the attitude of vessel owners regarding traditional occupation.

2.3 In accordance with the shift in fishing sector the SLI change revealed that those who shifted to M sector had a comparatively better level of progress. Accordingly, it may be concluded that the mechanisation process helped to improve the SLI of those who shifted from TNM to M or from TM to M and newly entered in the mechanised sector.

2.4 For measuring the impact of mechanisation on fishing vessel owners, a comparison on the income from vessels during catchment season from different fishing sectors and fishing regions was made. From the analysis it was found that the mean income of mechanised vessel owners stands high in all the three regions and it is very high in the central region owing to the heavy sized vessels and availability of modern equipments and facilities. The income during catchment season when compared according to shift in fishing sector revealed that the mean income of vessel owners increases in accordance with shift in operational sector. The increase in income in accordance with shift in operational sector proved that the mechanisation process raised the earning capacity of vessel owners during catchment season.

2.5 The analysis regarding off-season monthly income revealed that the TM sector owners have comparatively better income than M sector vessel owners. This is because of less operating cost and higher percentage of return to owner, when compared to M. The M sector vessel owners are also exploited by various middlemen and commission agents. The analysis further revealed that, irrespective of the fishing region, there is significant difference between off-season income of owners of different sectors. There is a difference in income between regions in TM sector, which is mainly due to the presence of more inboard fitted crafts in central region than the other two regions. The difference in off-seasonal income according to shift in operation is also found significant. It is concluded that the motorisation process enhanced the income of vessel owners during off season, but mechanisation could not gain advantage over motorisation because of heavy operating cost and repairing charges.

2.6 While analysing the operating cost of vessels, it was found that the mechanised vessels have more operating expenses than that of the TM sector vessels, in all the three fishing regions. The change in

fishing ground, nature of operation etc. are the major reasons for the same. The region wise comparison of M sector vessels is also found to be different. This is because of the lower duration of fishing in southern region and availability of facilities. The operating cost of vessels increased in accordance with the shift in operational sector. The incidence of heavy operational expenses during off-season reduce the earning capacity of M sector vessels.

2.7 The mean savings of mechanised sector vessel owners is comparatively higher than the others. While comparing the savings according to shift in fishing sector, it was seen that eventhough the mean savings increase slightly in accordance with shift in fishing sector, there is no significant difference among owners from different sectors regarding savings during catchment season.

2.8 The annual income which is estimated on the basis of seasonal monthly income, off seasonal monthly income, period of season, off-season and period of ban. The annual income was then compared to investment in vessels in each sector. The mean percent of return from each sector was arrived at and found that the TNM sector has high mean percent followed by TM and M. The major reasons for the same are uninterrupted operation of TNM vessels, absence of operating cost and less investment. In M sector, both investment and operating costs are very high, which results in less return. As part of it the savings and liability were also compared with investments and the same results were obtained.

3. Problems and Prospects

3.1 Views of workers

3.1.1 It is found that the workers from different fishing sectors have more or less same opinion regarding the prospects of mechanisation. It proved that the mechanisation process enhances the prospects of the industry with respect to income earning

capacity, reduction in manual efforts, creation of employment, accessibility to new fishing grounds and reduction in time for operation. The mechanised sector workers claim that there is increase in catches and export due to mechanisation, a claim which is not acceptable to the other sector workers. Altogether there is positive stroke in the industry as a result of mechanisation, even then that has not yet enabled to raise catches and exports on expected lines.

3.1.2 Here also it was found that though there are benefits from mechanisation it created some problems. The major problems due to mechanisation in the opinion of workers are entry of capitalists, underemployment, reduction in prices of catches, destruction of sea wealth, over exploitation by owners, entry of foreign trawler, lack of preference to aged ones and demand of technical knowhow. It is interesting to see the M sector workers also agreeing to this opinion. Whereas the opinion of TNM worker regarding over-exploitation of sea wealth is not acceptable to others in all respects. Similarly the claim of M workers regarding middle men exploitation was also found different among workers. Altogether the mechanisation process due to lack of proper control and restrictions brought certain problems to the industry in the opinion of workers.

3.1.3 Even after serious conflicts and agitations, it is interesting to see that the opinion of workers are unanimous with regard to replacement of trawling ban. Various suggestions for the same agreed by all sectors of workers without difference are need to restrict number of vessels, assign proper time for operation, ban on night trawling and overnight stay fishing, enact proper licensing to vessels and ban the use of destructive gears. Here also difference in opinion with regard to changing the months of trawling ban claimed by M sector workers and total ban on foreign

trawlers. It is therefore conclusive that restrictions are needed for preserving the resources of the sea.

3.1.4 The workers are of opinion that the mechanisation process has not been able to secure a steady growth in fish production and exports eventhough there is a notable growth in production.

3.1.5 The workers unanimously pointed out that for the further development to the fishing industry in general and for enhancing the potentials of mechanisation on positive lines certain restrictions and monitoring by government is required.

3.2 Views of vessel owners

3.2.1 In the opinion of owners of vessels with regard to the prospects of mechanisation they say that the process of mechanisation has brought about several benefits to the industry, like : increase in production, increase in earning capacity, increase in exports, attraction to outsiders and youngsters, capacity to catch more varieties from new fishing grounds, increased consumption and provision of competitive prices to fish. The degree of agreement in opinion regarding the above said factors among vessel owners from different sectors emphasises the fact that mechanisation process resulted in a tremendous prospects to the fishing in Kerala.

8.2.2 Inspite of the benefits resulted from mechanisation, it has also brought certain damages to the industry. Various problems due to mechanisation, listed out by vessel owners are : deterioration of marine wealth due to over and destructive exploitation, entry of foreigners, reduction in prices of catch, lack of facilities needed for fish landing and processing, heavy operational and maintenance costs. From the analysis it is clear that the vessel owners from all the three sectors agreed to the above said factors. This points out to the fact that absence of proper controlling and

monitoring in the mechanisation process resulted in certain serious damages to the industry.

3.2.3 With regard to trawling ban, majority of the M sector owners claimed that a total ban is required during monsoon period but it was not acceptable to TM and TNM vessel owners. The TNM owners demand for the extension of trawling ban for another 45 days. The views on trawling ban among fish vessel owners stand divergent.

3.2.4 In respect of the operation of foreign trawlers, the vessel owners from three sectors stand united and they argued that the operation of foreign trawlers in our sea is adversely affecting the industry. The experience of fishermen regarding this showed that the permission granted to foreign trawlers to operate in our sea adversely affected the industry.

3.2.5 As regards to the deep sea fishing policy of Government, there is no clear-cut opinion by the owners of vessels. Around 50% vessel owners from TM and M sector states it as defective and only 38.9% of TNM owners agrees with it. 20 to 25% from each sector states it as ineffective.

3.2.6 With regard to the absence of a steady growth in production and exports of fish from Kerala, the vessel owners have the same view irrespective of their sector of operation regarding reasons like restless operation of vessels, invasion of foreign trawlers, reduction in prices of seafood, lack of proper infrastructure and lack of support from government. But with regard to the M sector owners opinion regarding trawling ban as unscientific, which caused reduction in production and export, the M and TNM vessel owners differ significantly. From the analysis it is clear that there is an absence of steady growth in production and exports of fish

even after claiming mechanisation raised the production and exports.

3.3 Analysis of Production and Export

3.3.1 The production of fish from Kerala for the past 15 years reveals that there is only a slight increase and this increase was not in a steady manner. The compound growth rate of production for the last 15 years is only 1.06.

3.3.2 The export of fish from Kerala for the last 15 years period showed a slight increase but that was not a noticeable one. Here also the annual growth rate pattern shows the absence of a steady growth. The compound growth rate of export for the last 15 years is only 3.66.

3.3.3 The percentage share of export to production also showed a dwindling tendency and it is interesting to see that on an average only 15% of our production accounted for exports.

Recommendations

Based on the findings of the study, the following recommendations are made to improve the working of the mechanised fishing industry in the state of Kerala.

1. The government has to conduct a detailed survey of fisherfolk by primarily segregating them into two: workers and owners, secondly according to different sectors of operation namely, traditional non-motorised sector, traditional motorised sector and mechanised sector. This survey will help to :
   (a) Reach benefits provided by the government and other agencies to the deserved class.
   (b) To plan further motorisation and mechanisation, to uplift those who remained in traditional non-motorised sector and strengthen the present TM and M sectors.

(c) To provide effective training to the workers belonging to mechanised sector on the operations and introduce latest techniques in communication and maintenance of vessels.

(d) To segregate owners of vessels into small single vessel owners and owners of a fleet of vessels, thus help to study the concentration of wealth into the hands of a few.

2. The shift in sector, i.e., from traditional to modern has resulted in positive changes. It has tremendously improved the workers' social life index and earning potential as revealed by the study. Hence this trend of shifting from the traditional to modern sectors must be encouraged, by making the workers familiar of the recent developments that has been taken place in the industrial sector. They should also be motivated for shifting from one sector to another; by adopting the following mechanisms:-

   - The fishermen must be provided with awareness programmes on the latest developments in the fishing sector with the aid of agencies like SIFFS, PCO, Matsyafed, CMFRI, MPEDA etc.
   - Government must direct the banks and other financial institutions to provide financial assistance for acquiring vessels and gears for operation.
   - The FM radio, "Alakal" for the traditional sector workers may be extended to mechanised sector too. This can be used not only to promote the cultural integration of the workers but also to make them conscious of the changes in the fishing industry, this inturn motivate a shift in operating sector.

3. It is interesting to note that though there is a rise in income with the shift in sector of operation, the 'savings' from the increased income is almost negligible. This pattern of spending verifies the notorious adage that fishermen are spendthrift. Hence a conscious effort must

be made to develop a life style promoting savings for the fisherfolk. To achieve this:

- The Government can promote fishermen's credit co-operative societies that make collection on a day to day basis by volunteers who visit the fishermen's house.
- A fraction of the assured income of mechanised workers i.e., 'the bata' can be collected at ports and harbours by the fishermen's credit co-operative societies.

4. The shift in sector has brought about notable changes in the SLI and income during catchment season of owners. However, there should be further efforts on the part of the Government to keep the sector attractive. The suggestions in this regard are :

    - Conscious effort should be made to reduce the cost of operation and maintenance of mechanised vessels. For this subsidy should be provided for the fuel (Diesel).
    - Access to unexplored areas of fishing by further mechanisation and change of gears must be facilitated by scientific research.
    - Start resource centres for providing information to vessels regarding shoals of fishes at the nearby sites in sea under the initiative of the fisheries department. The resource centre can make use of the help of satellites for the same.

5. To enhance a continuous and steady growth of the industry as well as the return on investment of owners adopt strict measures like :

    - Ban on night trawling
    - Ban on overnight stay fishing by mechanised vessels (double day, three day operations)
    - Fix a time schedule for operation to all fishing vessels in sea.
    - Provide assistance to mechanised vessels for further growth and enable them to venture into international waters.

- Strictly enforce marked areas for fishing by vessels belonging to different fishing sectors. The enforcement can be strictly monitored with the help of coast guard and radar system which will also ensure the security of fishermen.
- Government with the help of agencies like CMFRI can plan the implementation of quota system of catches for modern sector vessels, this will control the over exploitation of sea wealth.
- A centralised agency can be set apart to fix fair price for catches and this will help the owners and workers to avoid exploitation by middlemen and seafood exporting companies.
- The development of infrastructure in a speedy manner is required for the enhancement of production and export of fish from Kerala. The inability to maintain standards fixed by international market is the major reason for low percentage of export to production from Kerala. Planned development and strict monitoring in this regard is a must for further growth and development of the industry.

6. Conduct scientific studies on the conflicting issues like trawling ban and resource depletion. Based on such studies total holiday period for the sea should be imposed on TM and M sectors.

7. For uplifting the fishermen community, the government should start and assist the educational, health, social and cultural establishments in coastal areas. The mechanisation programme initiated by INP had such broad objectives and they concentrated on the development of health centres, factories, water supply system, infrastructure facilities etc. Unfortunately most of such organisations and institutions are now in a pathetic condition. A careful planning and development should be made in this respect.

Topics for related research

(a) Problems faced by the sea food industry in Kerala.

(b) Influence of department of fisheries on fisheries development of Kerala.
(c) Influence of Tsunami on the socio-economic conditions of fishermen in Kerala.
(d) Environmental changes and its impact on fishermen in Kerala.
(e) A comparative study on the impact of mechanisation of fishing industry on fishermen of Kerala and Tamil Nadu.
(f) Influence of trawling ban on production, exports and social life of fishers.

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This volume has documented the mechanisation process and its multifaceted impacts on Kerala's fishing industry from the 1950s through the early 2000s. The findings raise as many questions as they answer, pointing toward critical areas requiring deeper investigation in subsequent volumes of this series.

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